

Subterranea

The Magazine for Subterranea Britannica



Subterranea Britannica



September 2017 Issue 45

IN THIS
ISSUE

Underground Dorking Part 2
Portland Site Visits

Visit to Clifton, Bristol
Wonderful Wonderful Copenhagen

Subterranea Britannica is a society devoted to the study of man-made and man-used underground structures and the archaeology of the Cold War. The society is open to all and its membership includes all walks of life. Members are invited to contribute to this magazine even if this just means sending very welcome snippets from newspapers and magazines.

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Front cover photo: Portland CEW(D) ROTOR Radar Machine Room. This image depicts the right-hand side of the machine room which receives an unregulated, 400v, 3 phase, 4 wire, 50c/s supply from the transformer in the entrance tunnel. The small, type 3 switchboard on the far right supplies this current via two star delta heavy duty starters (not seen) to two 3.5 kVA motor alternators (rotary converters) one of which is seen on the left and distributes this HF current back through the switchboard to the two T13 Mk6 and one Mk7, one T14 Mk8 and one Mk9 and the T54 Mk3 radar heads/transmitters. The larger (nearer) Type 4 switchboard distributes the 50 c/s current to the same radars to power the ancillary services. Photo Nick Catford

Back page upper: The Sub Brit group on the Copenhagen/Malmö weekend, assembled in front of the impressive Spitzbunker in Malmö. Unique in Sweden, the air-raid shelter was built to house workers at the adjacent Kockums shipyard. Photo Martin Dixon

Back page lower: The first group within the largest chamber of the Clifton Bridge Leigh Woods abutment. Smaller chambers lead off from this but are sadly out of bounds. Photo Gerald Tompsett

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The committee of Subterranea Britannica and the Editor do not necessarily agree with any views expressed and cannot always check the accuracy of any material sent in.

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Chairman's Welcome

Martin Dixon

I have to start this magazine's welcome with a sad farewell. Farewell, that is, to Chris Rayner who tragically died in mid-April. We all have much to thank Chris for as he arranged the speakers for our Day Meetings and organised many trips for members. Chris died just a week before our Spring Meeting and it says a lot for his skills that everything was perfectly set up and the day ran smoothly. Many members have suggestions for visits and other activities but Chris was someone who having had the idea, then put in enormous effort to ensure it reached fruition. There is a full appreciation of Chris's life in this edition of *Subterranea* and the Committee are considering ways in which we can all remember and permanently record Chris's contribution to our society.

I've enjoyed a number of trips in recent months – in particular the overseas weekend to Copenhagen which was a roaring success. Some of the sites we visited are open for public viewing so if you have a spare weekend then it has much to offer.

Copenhagen is a city with superbly preserved defences from the 11th to the 20th century, many of which of course have underground aspects. The Cold War coastal artillery and anti-aircraft battery site at Stevns alone justifies a trip to Denmark (regularly open throughout the year but Sub Brit enjoyed an extended tour).

Portland was also a fascinating day out; two widely contrasting sites within a mile or so of each other. A Rotor radar site which is a scheduled ancient monument followed by what is Britain's newest mine. The latter (a quarry to purists) has supplemented opencast mining on the Isle, partially to minimise the environmental impact and partially

to reduce the cost of removing the unproductive overburden. The mine visit was followed by a tour of the stone factory where old skills and new apprentices come together. Thanks to the site owner and Sub Brit member John Marquis for organising these visits. It's a particular pleasure to see new faces on site visits alongside longer-term members.

We always try and write up site visits to ensure that anyone who couldn't attend for whatever reason can still experience the site secondhand. These site reports also ensure we have a good record at a given point in time which can be valuable to researchers and to future visitors.

If you are lucky enough to find yourself below ground in an interesting space (which of course most are!) then do consider penning a few lines for the benefit of others. Don't worry if you're not an experienced writer – we value different styles and have sub-editors who can work on articles.

Finally, all current members should have received our latest UK Site Directory at the end of June. Many thanks to Linda who did the editing and layout; and to all the members who contributed corrections and additions.

It's particularly pleasing to see quite a few new sites added since the first edition six years ago. A number of these sites have benefited from Sub Brit grants to help with their restoration or safety equipment – a valuable way to use the charity's funds to benefit one and all.

I hope you all had some enjoyable summer travels, whether around the UK or to further-flung corners of the globe. I look forward to hearing about some of them at our Autumn Day Meeting on 28 October.

chairman@subbrit.org.uk

Subterranea Britannica Autumn Meeting 2017

Saturday 28 October, commencing at 10.00am

Royal School of Mines, London SW7 2BP

There will be the usual mix of interesting illustrated talks along with Members' contributions and a chance to meet and mingle with fellow enthusiasts. Speakers confirmed so far

* Chris Taft on 'Mail Rail'

* Tony Ginman of Hendl Lighting on 'King's Cross and lighting the Underground'

* Robert Youngs on Pope's Grotto

* Dr Paul Dobraszyk, author of 'Global Undergrounds' and 'Urban Ruins'

* Lauren Griffin of Derbyshire Caving Club on 'The mines of Alderley Edge'

* New this year: Members short contributions throughout the day

Please book in advance via the website at www.subbrit.org.uk/events or by post to our registered address

Non-members are very welcome to attend

Cost £20 to include a sandwich lunch, or £22 on the day



Chris Rayner 1954 – 2017

Martin Dixon

Chris Rayner, who tragically died on 15 April this year, had a life full of ups and downs. Up because he was a mountaineer and because his work as an architect often took him up high above the ground to inspect the fabric of church spires and other structures. Down because of his intense love of underground space and his passion for the exploration of subterranean structures.

Christopher William Manser Rayner was born on 17 June 1954. His father (after army service) was also an architect which sometimes entailed Chris holding the ends of tape measures up ladders and in the dark reaches of cellars; a portent of things to come. In his teens he was once run over by a site contractor but this obviously didn't deter him as he ended up following the same career as his father.

Chris's early life was full of thrills; he was a skilled mountaineer and ice climber and he travelled widely. He spent six months in Central America, looking for Mayan and Aztec temples, including being in El Salvador during their civil war. Whilst in Nicaragua he avoided night-time drug runners by switching off his torch and blending into the undergrowth. Chris never lost this spirit of adventure and his thirst for exploration.

He later worked on a construction site in remote Alaska with a pistol-packing boss. Chris sometimes used to take a light plane to the work site but stopped doing this after the pilot was encouraged by the manager to fly in with work materials such as polystyrene strapped to the plane's wings! His Master's degree was taken at the University of California where he was once hit by a tear-gas grenade on the Berkeley campus during a student demonstration. Coming back to the UK in the 1980s, he settled in Sevenoaks and with his wife Lesley, raised a family of one daughter and three sons. They describe Chris as knowledgeable, patient, kind and with an overwhelming love and affection for the family and for life. All characteristics that those who knew Chris will recognise, along with his love of jokes and mischievous sense of humour.

As an architect, Chris specialised in historic buildings, both restoration and renovation. Setting up his own practice in 1992, he firmly believed in sustainable living. He was an early advocate of ecological and environmentally friendly designs. He always said that he built homes and not houses and had a particular interest in the former lodges of larger houses which have themselves now disappeared.

Chris joined Sub Brit in 2007 and before long became an active and valued Committee member. He organised our Day Conferences around the country, set up innumerable trips and was a prolific contributor of articles and photos for *Subterranea*.



Chris at Paulsgrove Quarry, with two things he always carried – a camera and a beaming smile.

Our grants programme was also overseen by Chris where he used his wide network of contacts to ensure our limited funds achieved maximum impact. He was the perfect example of the maxim 'If you want something done then ask a busy person'.

Chris was also a member of other groups such as KURG (Kent Underground Research Group) and WCMS (Wealden Cave and Mine Society). He got involved with a number of projects, perhaps most notably at Fan Bay in Dover, where KURG and Sub Brit members worked alongside the National Trust to open the World War II Battery Shelter to the public.

His knowledge of WWII air-raid shelters was second to none. At our day meeting in October 2015 he gave a fascinating presentation on shelters around the UK. His deep knowledge and photographs deserved to be published more widely and we looked forward to this being the first of a series of talks. His wife Lesley attended the meeting and I'm sure became aware of the respect and esteem that we hold for Chris.



Chris with his camera and smile and trademark woolly hat. Taken at Fort Widley in 2016. Photo Chris Howells



His most recent trip for Sub Brit was to Clifton Suspension Bridge abutments and the Clifton Rocks Railway in March 2017. This as usual was a fascinating day out and the smiling faces at its conclusion said a lot. Other sites he arranged access to in recent months include RAF Barnham, Reading Scout Mine and Oxford and Maidstone ROC Group Headquarters.

To me, what marked Chris out from the crowd was his generosity. He gave freely of his time, his knowledge and his friendship. All those who knew or met him were richer for the experience. Sometimes quiet and always modest, he worked for the good of all and devoted much time for the benefit of others.

In mid-April, Chris collapsed while on a trip to Poland. Despite every endeavour, Chris could not be revived and so a great life tragically ended. It is some small comfort to know that he was doing what he loved when he died and that he was amongst friends. Although his passing was premature, he lived every day to the full and packed far more than most into his 62 years.

The news of his passing came as a great shock to us all. Lesley, daughter Joanna and sons Tom, Michael and John know that their grief is shared by all who knew him. At his funeral at St Lawrence Church in Sevenoaks, a packed church contained many members of Sub Brit.



The last trip Chris organised – inside Clifton Suspension Bridge abutments; Chris is second left. Photo Bob Clary

St Lawrence is the church where Chris and Lesley were married and is one of many churches for which he was responsible for the fabric.

St Lawrence Church was struck by lightning in May 2005 and the Chancel badly damaged by fire. Chris oversaw the restoration work with his usual attention to detail and the church is now as good as ever. So Chris will live on not just in our hearts but also in the many buildings that he built and maintained.

Although his last journey was fittingly underground, by rights he will now be looking down upon us from the highest level.

Obituary: Nesta Caiger 1928 – 2017

Nesta Caiger, a former member of Subterranea Britannica, was an important figure in Kent archaeology, a founder member of the Kent Underground Research Group and its chairman for nearly 20 years. She died in March 2017. Nesta was born in 1928 in Auckland, New Zealand, but accompanied her family when six years later they moved to England. They lived for some time in Croydon, where she attended the Woodside primary school, and from 1952 she was a member of the Archaeological Section of the Croydon Natural History and Scientific Society.

Much of her later life was spent at Barnehurst near Dartford in Kent. With her husband John she conducted important work on recording, photographing and researching deneholes (now generally interpreted as medieval chalk mines for agricultural purposes) and, after his death in 1975, continued investigations of underground sites in Kent.

Her article about a small lignite mine at Cobham Hall in Kent was published in the *Bulletin* of Subterranea Britannica (issue 24 in 1988). She was also co-author of a book *Kent and East Sussex Underground*, published in 1991. Other published articles dealt with, inter alia, topics such as Chislehurst ‘caves’ and other chalk mines, ice-houses and ice-wells, and an underground hospital at Erith.

She was an active member and later Honorary Member of the Kent Archaeological Society, a member of its governing body, and produced the *KAS Newsletter* for many years. She also served as secretary of the *London Archaeologist* journal.



Nesta Caiger in Darenth Woods denehole circa 1954

SOURCE: Rod Le Gear and Paul Sowan.



SUBTERRANEA BRITANNICA DIARY

Summary of Forthcoming Events

Sub Brit specific events

2017

- 16 September Paddock Open Day
- 9 - 13 October Gibraltar Study Tour (1)
- 16 - 20 October Gibraltar Study Tour (2)
- 28 October Autumn Conference, London
- 29 October Thames Tunnels Tour
- 1 November Copy deadline for *Subterranea* 46
- 4 November SB Committee Meeting
- Mid - December *Subterranea* 46 published

2018

- 27 January SB Committee Meeting
- 14 April SB Spring Meeting & AGM, London
- 20 October SB Autumn Meeting, Nottingham
- 21 October Visits Day, Nottingham

Other underground-related events

2017

- 7 - 10 September Glenfield Railway Tunnel Tours, Leicestershire
- 7 - 10 September Heritage Open Days, England
- 9 September Reigate Caves Open Day
- 9 September RAF Neatishead R3 Walk-through
- 9 - 10 September European Heritage Open Days, Northern Ireland
- 16 - 17 September London Open House
- 29 Sept - 1 October Hidden Earth (UK Caving Conference), Somerset
- 29 Sept - 20 October Highland Archaeology Festival
- September (various) Doors Open Days, Scotland
- September (various) Open Doors, Wales
- 14 October RAF Neatishead R3 Walk-through
- 20 - 22 October SFES Annual Congress, Laon, France

2018

- 6 - 9 March Conference on Caves and Karsts, Ardeche, S. France
- 21 April SERIAC Conference, Windsor
- 23 - 27 June AIA Conference, Caithness

2019

- 20 - 26 May Hypogea, Bulgaria

For web links to these events please visit www.subbrit.org.uk/events
or contact the Society concerned

*If you know of other relevant events run by other societies, please let us know
so that they can be advertised in the next edition and on the website*



Subterranea Britannica

Annual General Meeting 2017

Minutes

22nd April 2017, Lecture Theatre 1.31,
Royal School of Mines, Imperial College, London

By Sub Brit Secretary, Linda Dixon

The meeting was opened at 10.05 by the Chairman, Martin Dixon, who welcomed all those attending. 102 members were present.

Before the formal business began, Martin paid tribute to Chris Rayner who passed away suddenly on the 15 April. Chris was a Committee Member and tremendous contributor to Sub Brit, including arranging speakers for the Day Meetings, managing the grants and arranging numerous trips for members. We are truly shocked and saddened by his death. Our condolences have been passed to Chris's family and a short period of silent reflection was held. There will be a full obituary in the next edition of *Subterranea*.

1. Apologies were received from Mark Russell, Tony Radstone, Roger Starling, Chris Howells, Stewart Angell, Robert Wood, Stephen Oakes.
2. The Minutes of the AGM 2016 were published to all members in *Subterranea* December 2016. It was proposed by Alistair Graham-Kerr, seconded by John Burgess that the Minutes were a true reflection of the meeting; the proposal was accepted nem con
3. Annual Report. This has been published to all members and is on the website. Martin highlighted some of the key activities during 2016 and thanked all members who had contributed, both visibly and behind the scenes.
4. Statement of Financial Activities: Sub Brit's Accounts have been signed off by the Committee and Independent Examiner and have been filed at Companies House and the Charity Commission.
5. The motion that nominations for Sub Brit's Committee be considered 'en-bloc' was proposed by Stewart Wild and seconded by Sylvia Beamon. The motion was carried nem con.
6. The motion to elect the following Committee members for 2017/18 was proposed by Neil Iosson and seconded by Bob Clary. The motion was carried nem con.

The elected Committee for 2017/2018 is:-

Martin Dixon	Chairman	
Richard West	Vice Chairman	
Linda Dixon	Secretary	
Nick Catford	Membership Secretary	
Tony Radstone	Treasurer	
Alistair Graham Kerr	Member	
Jason Hughes	Member	
Richard Seabrook	Member	
Paul Sowan	Member	
Bob Templeman	Member	
Tim Wellburn	Member	
Phil Catling	Member	NEW
Chris Gray	Member	NEW

The Meeting closed at 10.25.



NEWS

Miscellany compiled by Paul Sowan and Nick Catford

NEWS – ARCHAEOLOGY

Archaeological finds from Crossrail on show at the Museum of London Docklands

The 42 kilometres of new tunnel created for Crossrail lie 40 metres or so below ground level, so pass well below archaeological evidence for the evolution of London. But at forty construction sites made between 2009 and 2015 strata just below the surface have been disturbed by shafts and station sites, and yielded a good haul of objects all of which have been recorded, along with their stratigraphical and environmental contexts, by a team of over 200 archaeologists. Five hundred of these objects were displayed in a special exhibition at the Museum of London Docklands in July and August.

The construction sites extend from Old Oak Common on the west side of London to Abbey Wood in the east. Artefacts date from 8,000 years ago to modern times. The oldest include a Mesolithic flint scraper, the smallest is the jaw bone of a mouse, and there are complete human skeletons, and a wealth of artefacts made or used by man. There are finds from the remains of a 15th-century moated manor house at Stepney Green, a first- or second-century cremation urn, and pickle pots and jars from a former Crosse & Blackwell warehouse at Charing Cross Road. Additions to London's archaeology left underground include unrecoverable parts of two tunnel-boring machines buried for future archaeologists near Farringdon Station.

SOURCE: MARCHINI, Lucia, 2017, Tunnel: the archaeology of Crossrail. *Current Archaeology* 28(1), 60–61.

Archaeologists use 3D digital modelling to shed new light on prehistoric mound

The 5,000-year-old Neolithic passage tomb known as 'Bryn Celli Ddu' in Anglesey includes a stone cemetery that was important for prehistoric people for thousands of years. Using ground-penetrating radar, researchers have found rock art and monuments that date back thousands of years, suggesting this burial complex was much bigger than previously thought.



Photo Matthew Richardson

Known as one of the most important archaeological sites in Britain, Bryn Celli Ddu was once constructed to protect and pay respect to the remains of ancestors. It was first discovered in 1865, reconstructed in 1920s and in excavations in the last few years they have uncovered a prehistoric burial cairn above the ground.

Experts believe Bryn Celli Ddu had five wooden posts which were built in the tomb's forecourt during the Mesolithic period. A large stone was placed in the centre of the pit which was covered in carved decorations and then the stone tunnel was made. Experts believe it was a place to hold meetings, dances and ceremonies.

SOURCE: *Mailonline*, 22 June 2017

Puzzles posed by human bones found in a cave in South Africa

Parts of the skeletons of at least 18 individuals of the primitive human *Homo naledi* are being studied, and dated to between 335,000 and 236,000 years old, far younger than previously thought. The implication is that *Homo naledi* and *Homo sapiens* lived at the same time.

The now extinct human species was about 1.5 metres when fully grown, and would have weighed about 45 kg. The species may have emerged in Africa around two million years ago, but evidently retained some primitive features found in older species.

The bones were found in the depths of the caves in a location which is accessible only with considerable difficulty, and appear to have been placed there as some form of funerary rite. The route to the burial chamber is through such tortuous and narrow spaces, far from the cave entrance, that it seems these ancient people were able to make and control fire for lighting. However, to date, no archaeological evidence, or artefacts, have been reported associated with the bones.

SOURCE: SAMPLE, Ian, 2017, Early human fossil find questions evolution theories. *The Guardian*, 9 May 2017, page 12.

NEWS – CONSERVATION AND HERITAGE

Monument's £1.5m revamp could open up Wren's underground lab, London

The Monument will get a £1.5million revamp under plans to open up Sir Christopher Wren's underground laboratory for the first time in decades. A new two-storey visitor centre at the 202ft column – opened in 1677 to commemorate the Great Fire of London – will allow visitors to see the chamber where Wren and Dr Robert Hooke peered into the night sky through the tower, which they designed to double as a telescope. At present the grate looking down into the chamber is covered by a left-luggage locker.



The capacity of the Monument, which can take 33 visitors at a time, would be increased. Tickets to climb the 311 steps cost £4.50 and this would rise by 75 percent. Councillors will decide whether to fund a £15,000 study to assess whether to go ahead with the project.

SOURCE: *Evening Standard*, 17 July 2017.

Tours of West Norwood cemetery catacombs suspended

Tours of the cemetery catacombs by the Friends of West Norwood Cemetery are to be suspended owing to access safety concerns. The final tour will be in October 2017. All participants must be FOWNC members for insurance reasons.



Photo Nick Catford

Tours will restart when access to the catacombs has been improved but FOWNC have not set a target date for restarting the tours. In recent years, a number of special tours for members of Subterranea Britannica have been arranged. FOWNC will still be able to take tours for specific groups like Subterranea Britannica if arranged well in advance and if adequate insurance is in place.

SOURCE: Bob Flanagan, Chairman FOWNC.

New display at Peak District Mining Museum, Matlock Bath, Derbyshire

The Peak District Mining Museum, opened in 1978 by the Peak District Mines Historical Society, is housed in the Grand Pavilion in Matlock Bath, and is highly recommended as an introduction to the geology and mining history of the region. Associated with the Museum is Temple Mine, a few yards away on the other side of the road, where visitors can visit a small underground working where fluorspar was once extracted.

This year the Museum has opened a new exhibition 'Matlock Bath through time', which is exceptionally well presented with historic photographs and artefacts, and portrays the development of Matlock Bath from a small hamlet to a Georgian spa resort to the popular

resort with various visitor attractions we know today. The scope of the exhibition is not restricted to the area's mining heritage, which is of course the subject of the museum as a whole.

Plans to open Devon air-raid shelter to the public get the go-ahead

A plan to restore a World War Two air-raid shelter in Newton Abbot has received unanimous backing from planners. The Courtenay Air-Raid Shelter Heritage Association now intends to turn the shelter in Courtenay Park into a living museum of the site and to bring it back to life. The shelter was built in 1940 and is made out of reinforced brick and concrete as it would have needed to protect the workers at the adjacent Newton Abbot railway station.

The heritage association would like to repaint the inside and outside of the building and create a new replica bench inside. The building still has some of its original interior features, such as the bunk beam slots and the original bench hangers and supports.



The association plans to add information boards with descriptive photographs and relevant information regarding the park, town and points of local interest in wartime and they feel the building could be put to good use for the public visiting the town and the park. It will offer local schools and groups the opportunity to view and learn more about its function and what effect the war would have had on residents living near the park.

This shelter is one of only a few remaining air-raid shelters in Newton Abbot and is the only remaining public shelter within a local authority open space.

SOURCE: *Devonlive.com*, 11 June 2017.

NEWS – HEALTH AND SAFETY

Health & Safety: Weil's Disease

Sensible cavers, and anybody else who spends any time exploring underground, carry a Weil's Disease card, which bears the following wording:

Weil's Disease

A bacterial infection spread by the urine of rats and cattle which can contaminate cave waters. It can enter the body through breaks in the skin or via the eyes, nose or throat. Mostly Weil's Disease resembles an attack of flu but it does kill around 5% of people infected in England and Wales.



Symptoms usually develop 7 to 21 days after initial infection. Early symptoms can include severe headache, chills, muscle aches and vomiting. Later symptoms may include return of fever, jaundice, red eyes, abdominal pain, diarrhoea, or a rash

WEIL'S DISEASE CAN BE A FATAL ILLNESS IF UNTREATED

If you become ill after caving and have any of these symptoms **CALL YOUR GP IMMEDIATELY**

Tell your doctor you may have been in contact with Weil's Disease and show this card or BAC's e-leaflet. **IF SUSPECTED ADMINISTER ANTIBIOTICS IMMEDIATELY**

TESTING FOR DISEASE. A blood test is usually undertaken to confirm this illness. The sample should be sent direct to RLIP, Public Health England, Manor Farm Road, Porton Down, Wiltshire SP4 0JG. Tel. 01980 812348, using the form supplied at https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/346000/P1_Rare_and_Imported_Pathogens.pdf . Issued by the British Caving Association 2016.

See www.british-caving.org.uk .

Rats or cattle urine can be found in all kinds of underground sites, not just natural caves.

NEWS – MILITARY AND DEFENCE

World War I practice tunnels on Salisbury Plain, Wiltshire

A substantial network of tunnels and trenches dug to train troops during WWI has been discovered on army land being cleared for housing. Archaeologists who worked on the site at Larkhill, in Wiltshire, said the century-old complex was a valuable discovery.

This is the first time anywhere in the world that archaeologists have had the chance to examine, excavate and record such an enormous expanse of WWI training ground where soldiers were being trained for the real thing, using live grenades (200 grenades were found in the tunnel and 50 percent of them proved to be still live). Archaeologists had to work side by side with experts in dealing with live ordnance.

The site is full of evidence of the soldiers who trained there. Graffiti still covers many of the tunnel walls, and some of it has been matched to service records, including those of Yorkshire coalminers, two brothers who signed their name 'Halls' with the motto 'Semper Fidelis', and one man who later deserted.

The recruits left mess tins, combs, toothbrushes, cigarette and tobacco tins and pipes, candlesticks and candle stubs, tins of condensed milk and meat paste, a jar of Canadian cheese and a tin of Australian toffees, as well as scorch marks from their cooking fires and candles. A bucket was found that had been adapted into a brazier to help combat the bitter cold at night.

The men being trained to fight on and under the battlefields of France and Belgium couldn't have known that their



tunnels ran through millennia of earlier history. The site is two miles from Stonehenge, and the excavation also uncovered a wealth of prehistoric material, concentrated around the dry valley through which the river Avon once flowed. The discoveries included an enclosure older than Stonehenge, a small henge monument, Iron Age round huts lived in at the time of the Roman invasion, and a miniature pottery beaker found with the bones of three children buried 4,000 years ago.

The archaeologists believe the training land began with the trenches, and then the tunnels were added from 1915 as the nature of the war and the fact that it would certainly not be over by Christmas became clear. In places the tunnels are several levels deep, cut up to 6 metres below the surface.

The men were trained to dig listening posts and sit, stethoscopes to the wall, listening for enemy activity, and then dig deeper tunnels to run under the enemy posts. Some of the men who fought at the Battle of the Somme in 1916, which began with mines being detonated in deep tunnels, and the Battle of Messines, which began in June 1917 with 19 mines being set off under German trenches, were trained at Larkhill.

The tunnels were found as work began on the army land to prepare a site for 400 new houses for service personnel and their families. The tunnels were permanently sealed and pumped full of a slurry made from the excavated chalk before construction could continue.

SOURCE: *The Guardian*, 24 April 2017.

World War II air-raid shelter recorded at Eltham, Greater London

An air-raid shelter under a school playground in Eltham has been the subject of historic building recording before its proposed infilling with concrete as a result of a recent structural assessment. The shelter, thought to date from 1939–40, is of pre-cast concrete frames and panels. Three stepped main entrances would have fronted Archery Road, and there were seven emergency escape exits fitted with ladders.

The layout is irregular, with narrow passages that would have been fitted with benches. No evidence for bunks was noted, and little survives of original fittings other than



electric lighting circuit conduits and traces indicative of telephones. One graffiti was recorded.

SOURCE: DAVIS, R., 2017, Eltham, WWII air-raid shelter, Eltham Church of England Primary School (TQ 42980 74542). *Post-Medieval Archaeology* 50 (3), 459–460 [Abstract]

WW2 bunker on the Wirral to open to the public

During the war the Ministry of Defence used cellars and a network of tunnels beneath the New Brighton Palace amusement arcade on the Wirral as an ammunition factory. There are now plans to open the bunker to the public.

The underground factory employed 200 women, was a base for fire wardens and an air raid shelter, and there was even enough space for a social club for the workers. Now, after 70 years, the munitions area has been opened for visitors who can marvel at the original machinery.



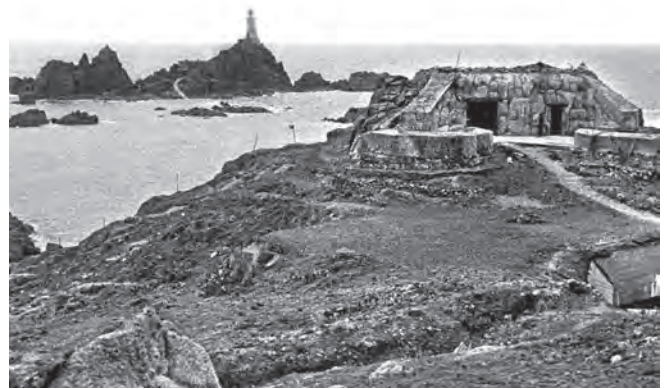
The munitions part of the tunnels have not been seen by the general public and the rest of the old tunnels were used as The Creep Inn night club. Visitors will be able to experience what life was like during wartime in New Brighton and will learn of the American army who were stationed there from 1942-45. There will be wartime film showings, dances and dinners with ration food at the venue as well as lots more historical pictures based on the history of Wallasey through time.

Tours are run by Hidden Wirral Myths and Legends. tickets cost £7, there are limited spaces per tour and advanced bookings are advised. www.hiddenwirral.org
SOURCE: *Metro*, 31 July 2017

Another German bunker on Jersey to be opened to the public

A WWII German bunker in St Brelade which has been closed for more than sixty years will be reopened to the public this summer. The Channel Islands Occupation Society has been cleaning an eight-room coastal defence gun casement at Corbière Lighthouse and they hope that the project will be finished by the end of August.

A team of six have been working to make the underground bunker, which is buried below the car park, safe for people to visit. The bunker was closed in 1953 by the authorities and only a handful of people in the Island had ever been inside.



The bunker in the 1950s

There was a scrap metal drive in 1953 and they went into the bunker and removed the French 105mm gun, which would have weighed around two or three tonnes. They also took the armoured doors and any other metal they could find before they boarded up the bunker. The back entrance was buried and the embrasure was sealed up.

The bunker remained hidden until 1989, when the CIOS broke through the sealed door to investigate if there was anything worth salvaging, only to block up the entrance shortly after. In 2006, when vandals broke into the fortification, the CIOS decided to eventually reopen the bunker. It is not a restoration project. This bunker tells the story of what happened to the German defences after the war, and of how the scrap merchants were interested only in profit, not preservation.

SOURCE: *Jersey Evening Post*, 22 June 2017.

World War II air-raid shelter recorded at Leyton, Greater London

An archaeological evaluation at the Jenny Hammond Primary School, Worsley Road, Leyton in east London has revealed rubble-filled cut features and the partially demolished remains of an underground communal air-raid shelter comprising a stairway with flanking walls of reinforced concrete leading down to an entrance of pre-cast concrete slabs.

SOURCE: COWIE, H., and M. McKENZIE, 2017, Eltham, WWII air-raid shelter, Jenny Hammond Primary School (TQ 393 859). *Post-Medieval Archaeology* 50 (3), page 475 [Abstract]

Joint Military Headquarters, Bodø, Norway

Bodø, just inside the Arctic Circle, is Norway's closest town to the 122 miles (196km) Norwegian / Russian land border. An account of a visit to an underground bunker near the town has recently been published. Although the bulk of the text concerns Norwegian–Russian relationships, some brief details of the bunker itself have been given. A 'vast cave chiselled out of a mountain of quartz and slate' accommodates the Norwegian Joint Military Headquarters.

The bunker is 'at the end of a long whitewashed tunnel gouged through the mountain in 1963' but originated as a German work during the occupation of Norway in





World War II. Rooms full of electronic hardware are dedicated to monitoring surface, submarine or airborne movements in this far northern part of Norway and extreme northwestern part of Russia.

SOURCE: WINTOUR, Patrick, 2017, In Norway's cold war citadel, wary eyes turn to Russia once again. *The Guardian*, 13 March 2017, page 15.

WWII air-raid shelter found by workmen in Montrose

A complete and well preserved air-raid shelter has been found by workmen on Scottish Water land that was once part of the site of RAF Montrose, the first operational military airfield in Great Britain. Several air-raid shelters and gun emplacements can be found around the old airfield, a major training centre for pilots during both world wars, but Scottish Water said the find had been an "unexpected discovery," and Scottish Water have now adapted their plans slightly to fit round it.



Scottish Water is currently installing solar panels to power its water treatment works. RAF Montrose was created in 1912 as one of 12 "Air Stations" to be operated by the Royal Flying Corps. Its North East location was designed to protect Royal Navy bases at Rosyth, Cromarty and Scapa Flow. Originally located at a farm just south of the town, it was moved to its current location in 1913 given the flat ground, the well drained sandy soil by the beach and its easy access to the rail line. Similar shelters can be seen around the airfield.

SOURCE: *The Scotsman*, 21 June 2017.

Crawley nuclear bunker likely to be demolished in 2018

The nuclear bunker beneath Crawley Town Hall will be demolished, along with the town hall itself, if major

redevelopment plans for 250 new homes, offices and a new town hall go ahead as planned.

The Crawley Borough Emergency Centre was built in 1979 with the aid of Home Office cash and was originally intended as a control centre in the event of nuclear attack. Access is via a heavy steel and concrete blast door into a decontamination room which had a huge communal tiled shower which could accommodate eight people at a time.



*Sub Brit visit to Crawley Emergency Centre.
Photo Gerald Tompsett*

The bunker is located in a basement at the town hall in The Boulevard and, although decommissioned and no longer operational since the Emergency Centre staff moved to a new office in the Town Hall in the summer of 2001, it still retains many of its original features. An emergency escape tunnel from the building has now been filled in. Rooms in the bunker have mostly been stripped in recent years and the bunker used for ballot box storage and election material.

The bunker was visited by members of Sub Brit in August 2001. Following news of the future demolition of the bunker Sub Brit member Bill Ridgeway arranged a visit for 11 members on 8 July.

SOURCE: *West Sussex Gazette*, 15 May 2017

World War II air-raid shelter open to visitors in Zagreb, Croatia

Zagreb, capital of Croatia, is an attractive city. Your scribe spent two days here some years ago on the way home from representing Subterranea Britannica at a conference on the Adriatic coast, and was impressed by the archaeological, historical, scientific and technical museums.

A new visitor attraction is now being developed in a World War II air-raid shelter. A so-called 'alternative promenade' has just opened, the Gric tunnel, which is being converted into a 'multi-sensory museum' but 'for now you can roam its atmospheric catacomb-like corridors which are littered with war graffiti'. The intended museum is to be devoted to a 'Museum of Broken Relationships' in which 'relics will detail failed loves'.

SOURCE: MELLOR, Richard, 2017, Night on the tiles in pretty Zagreb. *Metro*, 27 April 2017, page 41.



Cannabis to be grown in a nuclear bunker legally

In recent years cannabis farms have been found in the RGHQs at Drakelow and Chilmark. In Lower Pottsgrove in Pennsylvania, USA, a company is hoping to harvest the drug in a nuclear fallout shelter legally.

Bunker Botanicals LLC received support from the township commissioners after presenting a plan to convert an underground communications equipment bunker built in the 1960s to a marijuana growing facility. The 50,000-square-foot facility would meet all state security requirements and could be one of the most secure sites in Pennsylvania.

The facility would be used to manufacture state-approved medical marijuana in various forms, including oils and capsules. The products would be delivered to state-licensed dispensaries, which cannot be located at the growing site.

SOURCE: *Berks & Beyond*, 24 February 2017.

Hawaii prepares for nuclear strike by North Korea

People in Hawaii are keeping a close eye on North Korea after the Pentagon warned that North Korea could launch further missile tests.

North Korea's successful Intercontinental Ballistic Missile (IBM) test in July caused global alarm and experts say Alaska and Hawaii could be in range. Hawaii is the first state to announce a public campaign urging those living there to prepare for a nuclear attack.

A bunker, located under more than 1000 feet of rock, could soon be used as an ideal place to ride out a nuclear attack. It would take less than 20 minutes for a nuclear missile to reach Honolulu – something state officials want the nearly 1.5 million people who live in the islands to prepare for.

In the event of a nuclear emergency, State Representative Gene Ward wants key government officials to have a safe place to operate, beneath Diamond Head. The facility houses a little-known network of tunnels built into the dormant volcano that the military has used for more than a century.



Tunnel into the volcano crater at Diamond Head. The tunnel entrance has gates to seal the crater and a cover to catch falling rocks

It was designed to withstand an artillery barrage and also to unleash an artillery barrage in the opposite direction. It was

however designed for equipment, material and weapons and not people. Every vital public service in the islands can be controlled from within the two miles of air-conditioned tunnels. Back in the 1950s, the government turned these old ammunition storage rooms in the tunnels into a civil defence hub. To date, the state's emergency operation centre runs 24–7 in an underground bunker nearby.

Emergency officials believe the majority of the population would survive the initial explosion. What they need to be prepared for is the nuclear fallout and to stay inside for up to two weeks.

SOURCE: *CBS News*, 27 July 2017.

NEWS – MINING AND QUARRYING NAMHO Conference and Field Meeting at Godstone, Surrey

The National Association of Mining History Organisations, of which Subterranea Britannica is a member, held its 2017 Conference and Field Meetings based at Godstone in east Surrey during the weekend 24 and 25 June, with some additional visits on Friday 23 and Monday 26. The event is always organised by one of the Association's member bodies, the hosts this year being the Wealden Cave and Mine Society.



Descending the Sheldwich Dene Hole. Photo Matt Clark

The local society was celebrating its 50th anniversary, having started life as a caving club called Unit 2 Cave Research and Exploration in 1967. WCMS is both a caving club, with frequent caving visits in the Mendips and South Wales, and an industrial archaeology group actively engaged in connection with underground sites



in Surrey. WCMS has previously hosted a NAMHO conference, based at Juniper Hall near Dorking, in 2005. As usual, most of those attending spent the weekend under canvas, at a farm near Blindley Heath, several miles south of Godstone. There were two days of lectures held in the village hall in Godstone and, concurrently, two full days of field meetings to locations throughout southeast England, including of course some of the numerous mines in east Surrey. Interestingly, neither the lectures nor the field visits were restricted to strictly mining topics in the sense of mineral extraction. Mined tunnels were created for their usefulness as secure underground space as well as for the sake of the excavated minerals.

The lectures included presentations on the Trevithick Society's work in Cornwall; the WCMS development of the 'Reigate Caves' as a visitor attraction; the Surrey hearthstone mines and the hearthstone trade; the reopening of the Fan Bay WWII air-raid shelter tunnels and re-excavation of two sound mirrors near Dover; exploration of quarries at Windrush in Gloucestershire; investigating limestone mines at Burwash; and work at the Cold War bunker at Wartling, East Sussex.

Field visits underground featured stone quarries at Merstham and Godstone; sand mines at Reigate and Godstone; an iron mine near Wadhurst; a dene hole and ice-house at Sheldwich Lees in Kent; the Wartling bunker in Sussex; and some tunnels at Dover. There was also a surface walk to see underground quarry locations and associated tunnelling sites at Merstham, Surrey. A conference booklet was issued to those attending, containing useful information on sites visited. About a hundred persons attended the weekend, some travelling from as far as Cornwall and the North Pennines.

Death of Ivor Brown

Ivor John Brown died on 4 April 2017 aged 79. He was a mining engineer who alongside his professional work played a very significant role in the work of voluntary mining history societies and in the National Association of Mining History Organisations.

He was born at Madeley, near Ironbridge, in Shropshire on 20 April 1927, left school at the age of 15 and found employment with the National Coal Board. During a seven-year apprenticeship he attended a technical college at nearby Oakengates, and the North Staffordshire Technical College at Cannop. He was awarded his Mine Manager's Certificate in 1959 and Mining Diploma in 1962.

After 10 years in the Shropshire mines, then in the process of being closed, he qualified as a lecturer in Mining Engineering. Five years later he found employment with Telford Development Corporation, addressing the problems associated with the legacy of abandoned coal mines, and for this work was awarded his PhD by the University of Leicester. The abandoned limestone mines under Lincoln Hill were also within his attention. He served subsequently as Minerals Officer for West Yorkshire, moving then to live at Sandal near Wakefield.



Photo Kelvin Lake

Ivor was actively engaged in the work of voluntary societies such as the Shropshire Caving and Mining Club and the Peak District Mines Historical Society, and others, and he was for a while a member of Subterranea Britannica, attending an early study weekend held at Maastricht. On that occasion he found the replicated coal mine in a former building-stone quarry at Valkenburg of particular interest. The Dutch coal mines had been closed by then, but artefacts and machinery from them are preserved and well presented in a former building-stone quarry at Valkenburg.

Ivor was also involved in the development of the Ironbridge Gorge Museum, and the National Mining Museum for England at Caphouse, near Wakefield.

His published work, commencing in 1961 with an article on the Meadowbank rocksalt mine published in the Cannock Technical College Students' Magazine, ran to over 90 papers on mining and mining history. It was followed by numerous published articles and papers, and two books.

SOURCE: BROWN, Ivor John, 2017, Farewell Ivor Brown. *Descent* 256, page 17 and Paul Sowen's records; Mike LUFF, 2017, Obituary. Ivor John Brown PhD, 20 April 1937 – 4 April 2017, *Newsl. Peak District Mines Historical Soc.* 163 (July 2017), 5 – 6.

Death of Trevor Ford

Trevor David Ford, an academic geologist at the University of Leicester, died on 22 February 2017 at the age of 91. He was born in Essex in 1925 but lived subsequently in Sheffield. On leaving school he worked as a bank clerk, 1941–44, before being called up and joining the RAF.

In 1946 he enrolled at the University of Sheffield, graduating with honours BSc in geology in 1950, and being awarded a PhD in 1953. A teenage interest in mines and caves endured throughout his life, and he became a highly respected historian of mining. He was in turn lecturer, assistant lecturer, and senior lecturer in the Geology Department at Leicester.



Beyond exclusively professional and academic pursuits, he was an active member of voluntary sector bodies devoted to the exploration and understanding of both natural cave systems and underground mineral extraction. He was an especially active member of the Peak District Mines Historical Society, whose *Bulletin (Mining History)* he edited for around 36 years.

Much of Trevor's published research from 1954 onwards addressed the legacy of mining in and around Derbyshire, and over 500 books and papers include valuable information on, additionally to the lead trade, the mining of minerals other than metalliferous ores such as barytes, calcite, chert, fluorspar and its 'blue john' variety, limestone, 'marble', and rottenstone. He also wrote significant accounts of the history of geology and mining.

He was made an Honorary Member of the British Cave Research Association in 1977 and awarded an OBE in 1997 for services to cave science and geology.

SOURCE: ANON, 2017, Obituary notice: Dr Trevor D. Ford. *Bull. Grampian Speleological Group*, Series 5, 2(2), page 39 and Paul Sowan's records; Richard Shaw, 2017, Obituary. Trevor D. Ford BSc PhD FGS OBE 1925 to 2017, *Newsl. Peak District Mines Historical Society* 163 (July 2017), 4 – 5.

Wealden Cave and Mine Society assist in quarrying Reigate stone, Merstham, Surrey

Members of the Wealden Cave and Mine Society have assisted with the opening of a temporary quarry at Merstham in east Surrey. This was in order to win some Reigate stone for use in a display of building stone in new work at Westminster Abbey. Samples of the stone types used in the Abbey are being incorporated in a new lift shaft to serve visitors to the triforium.



The temporary quarry at Merstham. Photo Peter Burgess

The site chosen was between the old (1841) and new (1899) main railway lines, south of the Merstham tunnel portals. The stone bed was known to lie at shallow depth at this location as a crown hole collapse had in 1971 allowed access to a very short length of subterranean quarry tunnel, from which two 19th-century clay tobacco

pipes were retrieved. Two photographs of the re-exposed quarry tunnel reveal it to lie at a depth of three to four metres below ground level. The pit, opened in January 2017, has now been back-filled.

SOURCE: BURGESS, Peter M., 2017, New Reigate stone quarry opened – briefly! *News of the Weald* 99, pages 3 and 11.

Surface visit to the Shenley chalk mine, Hertfordshire

Your scribe visited the chalk mines at Shenley some decades ago. The mine, or mines, evidently developed from four shafts, perhaps initially serving small independent mines which have become linked. My memory is of a wire ladder descent, not to the mine floor but to the top of a substantial debris cone comprised in part of dead sheep. The remainder of the descent of this pile of rubbish brought you to the mine floor itself, and half a dozen or so interlinked loft galleries. The lower ends of another two shafts could be seen, as could a mass of clay supposedly blocking a fourth shaft said to be below what is now a pond.

The site has now been visited by members of the Geologists' Association who peered down the open shaft but did not descend. The visit report, however, is accompanied by a plan of the mine, derived from the Chelsea Speleological Society's records, and a useful description of the site, which is near Pinks Farm, between Ridge and Ridge Hill, not far from the South Mimms Service Station.



Underground at Shenley. Photo Don Wood

The open shaft is 'in the farmyard' of one of the farm cottages, some 20 metres deep, the top five metres being brick lined as it was dug through a superincumbent bed of unconsolidated Reading Beds. Nearby is an abandoned and overgrown clay pit dug in connection with brick-making, suggesting that chalk was dug from the mine, as elsewhere, to mix with the brick-clay. The brickfield was evidently still active in 1913, and at this location a brick kiln is shown on Dury and Andrews' map of 1766. Two probably still active small natural subsidences were noted, formed by solution of the underlying chalk. The fourth 'mine shaft' may in fact be in reality the clay filling of such a solution feature, not a mine shaft at all.

This well-preserved and infrequently visited chalk mine is currently being researched by members of the Kent Underground Research Group. Preliminary conclusions are that this is a 19th-century mine worked in association with a brickfield, and closed at about the start of World War I. It is now a protected bat hibernation site.

SOURCES: HOWGATE, Mike, 2017, Field meeting report: the geology around South Mimms, Hertfordshire, 15 April 2017. *Geologists' Association Magazine* 16(2), 30 – 31; WEALDEN CAVE AND MINE SOCIETY, 2017, *NAMHO Conference 2017*. [Booklet issued to those attending]

Underground quarrying resumed at Collyweston, Northamptonshire

Collyweston has been a source of 'stone slates' used on the roofs of buildings in and around Lincolnshire and Northamptonshire, and as distant and venerable as colleges in Cambridge. The fissile sandy limestone (not geologically a true 'slate' which is a metamorphic rock) has reportedly been quarried underground for at least six centuries.



Nigel Smith inspecting a seam of slate in his newly re-opened mine

Quarrying having ceased some 50 years ago, modern demand for Collyweston 'slate' has hitherto been met by recycling material from the roofs of redundant barns and the like. However, the quarry is now reopened to supply new material for reroofing a building at King's College, Cambridge. There is also the possibility of supplying material for Clare College. It is estimated that the reserves at Collyweston can yield 200 tons of 'slate' annually for the next ten years. Similar fissile stone 'slate' has also been quarried underground in the past at Stonesfield in Oxfordshire.

SOURCE: SAWER, Patrick, 2017, Fresh lease of life for one of Britain's oldest slate mines. *The Daily Telegraph*, 9 March 2017, page 14.

Progress with Woodsmith polyhalite mine near Whitby, North Yorkshire

Work is progressing with the development of a new deep mine near Whitby in North Yorkshire. Sirius Minerals plans to commence production of polyhalite, a potassium mineral used in agricultural fertilizers, in 2021.

Initially ten million tonnes per annum of polyhalite are to be extracted, with production to be doubled in due course. The mineral raised will be transferred to harbour facilities at Teesside by way of a 23-mile tunnel to avoid intrusion in the North York Moors National Park. The mine is expected to employ 1,000 persons when operational.

SOURCE: SIRIUS MINERALS, 2017, Aggregates for Whitby mine. *Modern Railways* 74(825), page 20.

Possible reopening of South Crofty tin mine, Cornwall

The long-closed South Crofty tin mine near Camborne is currently owned by a Canadian company, Strongbow Exploration Inc., which concern has reportedly pledged investment in the redevelopment of extraction at this location. There is currently a healthy worldwide demand for tin, and the current high price of the metal at £17,000 per tonne is more than double that current as recently as 1998. Other mines in the county are also now seen as economically potentially worth redevelopment, including those in the Kit Hill area of eastern Cornwall.

SOURCE: ANON, 2017, Could 2017 mark real progress towards the reopening of at least one Cornish tin mine? *Down to Earth* 98, 6–7.

Groundwater once a nuisance to tin miners now seen as a valuable resource, Cornwall

A company called Cornish Lithium has in view exploratory boreholes in 300 square kilometres of land centred on the traditional mining areas of Camborne, Redruth and St Day, the object in view being lithium-rich brine which once flooded the then-active tin mines. Lithium is a reactive metal closely resembling sodium and potassium. If children remember any chemical demonstration from their schooldays it is usually the spectacular behaviour of potassium metal when dropped in water.

The ultimate sources of Cornish lithium include the mica group mineral lepidolite, but extracting this from raw granite, or even from the 'rotted' granite and mica spoil from china clay waste tips, would be prohibitively expensive. Fortunately geothermal (hot) water circulating at depth in west Cornwall has obligingly dissolved soluble lithium compounds from the native granite. Isolating purified lithium compounds from the other salts in these hot brines is now seen as economically feasible, followed by isolation of the metal itself.

The economics are now favourable on account of rising world demand and prices for lithium, increasingly important in batteries for electric cars and for power storage, and in laptops, cameras and mobile telephones. As a bonus, the hot water itself is a potentially important energy source. Currently, the world's requirements for lithium are met by Australia, China, and South America.

SOURCE: MORRIS, Steven, 2017, Poldark county sets sights on lithium bonanza. *The Guardian*, 20 January 2017, page 31 and *Descent* 256, page 17.



Archaeology of the chert mines at Bakewell, Derbyshire

Chert is, chemically and mineralogically, a very similar material to flint. It is composed of one of the several forms of the very hard mineral silica (silicon dioxide). There have been three British sources for chert used as grindstones in mills where calcined flint (from the chalk of southern England) was ground for use in the pottery industry. Other extraction sites were in Flint (Wales) and Swaledale (North Yorkshire). Opencast working and later mining at Bakewell apparently dates from the late eighteenth century, and came to an end in the 1960s.



Holme Bank chert mine

This exemplary study addresses the geology and geological context of the Bakewell chert, and the mining methods employed in its extraction. It is copiously illustrated with mine plans and photographs of underground features. A short section notes other English locations where rock has been quarried underground, such as the Bath area and east Surrey. Regrettably the wide-ranging list of bibliographical sources for comparable areas includes one relating to underground quarrying at Merstham in Surrey which was not the work of the cited author, but a plagiarised version of a publication compiled by members of the Croydon Caving Club.

SOURCE: BARNATT, John, and Terry WORTHINGTON, 2017, Quarrying chert at Bakewell: a detailed archaeological survey of Pretoria mine and observations on Holme Bank, Holme Hall and Endcliffe mines. *Mining History* 19(6), 1–119.

Scottish gold offered for sale

Scottish gold newly mined at the Cononish mine at Tyndrum was on sale to the public on 29 November 2016. This is the first sale of the metal sourced from Scotland for more than a century. Commercial gold winning was once carried out on a small scale at Wanlockhead in Dumfriesshire and at Kildonan near Helmsdale in Caithness.

SOURCE: SCOTGOLD RESOURCES LTD, 2017, First Scottish gold sold. *Down to Earth* 98.

Tin mining in Portugal

Long-established tin mining near the Portuguese village of Portelo in Braganca province, close to the Spanish border, was developed commercially in 1958, where exploitation

continued at the Mina de Vale da Ossa (Bear Valley Mine) underground until the 1980s and, opencast, until 1995. Numerous mine buildings and structures, including the ore dressing plant, remain standing. Some still accessible levels have been gated but left unlocked, and give access to stopes (worked-out steeply inclined mineral veins).

Open stopes at the surface have mostly been capped, although a few of the smaller ones remain open and a potential hazard to persons exploring the site as they are largely hidden by vegetation. The 1,130 hectares site produced 3,000 tons of cassiterite (tin oxide) ore in the 1970s. Significant reserves exist, which may one day be exploited again if tin prices move favourably. The site is described as ‘interesting, with lots to see’ but ‘take a hard hat, wellies and a lamp’.

SOURCE: ANON, 2017, Bear Valley mine. *Descent* 256, page 15.

NEWS – MISCELLANEOUS

Two lost Archbishops of Canterbury found under former church in Lambeth, London

St Mary’s Church, decommissioned in the 1970s, now houses the Museum of Garden History, administered by the Tradescant Trust. It stands next to Lambeth Palace. Recent work on the church floor has revealed a long-forgotten burial vault which, on inspection, has been found to contain twenty lead coffins.

There are no clues to the identities of most of the deceased, but two contain the remains of former Archbishops of Canterbury, Richard Bancroft (Archbishop 1604–1610) and John Moore (Archbishop 1783–1805). The coffins of Moore’s wife Catherine and one Bettsworth (1677–1751) have also been identified.

SOURCE: TRADESCANT TRUST, 2017, Archbishops emerge from Lambeth church. *Current Archaeology* 28(3), 12–13.

Construction of a tram line unveiled hidden remnants of the old medieval city in Nice

In 2004, while workers were constructing a new tram line between Pont Michel and Las Planas in Nice, they stumbled across something odd: fragments of an old medieval city, hiding in a 6,000-square-foot chamber just beneath the ground.

The chamber has been open to the public since October 2012. The chamber’s entrance is right next to the tramway that runs parallel to Place Jacques Toja in Old Nice, where a small trapdoor opens to reveal a staircase. An elevator bearing a poster advertising *La Crypte de Nice* is the only clue revealing what lies just 20 feet below the ground. When it is closed even the staircase disappears. A panel seals the entrance, making it blend in with the rest of the square.

Sightseers are first greeted by a map of the old city, complete with a red circle that indicates the location’s past life as an old wall that once formed the barrier between Nice and the surrounding land. Old walls and a well





Part of the medieval aqueduct

preserved 14th-century tower are among the first visible artefacts. Bits of medieval houses that belonged to the Augustin family and an aqueduct that once brought water to the Sardinian King's palace lie deeper within the crypt. This area also holds the remnants of a bridge that led to Turin, Italy and a 17th-century moat built to protect the then-independent Nice from French invasions.

Plaques with illustrations are scattered throughout the underground city to help visitors imagine how the place might have originally looked.

SOURCE: *Atlas Obscura*, July 2017.

Alexander Pope's grotto at Twickenham

The poet Alexander Pope (1688–1744) lived the last quarter of a century of his life in a Palladian mansion which he had had built on the banks of the Thames in Twickenham in 1720. His house incorporated a grotto in the basement. This served as an impressive entrance for guests arriving by water, being the finale to a walk through the five-acre garden. The grotto was evidently suggested by Pope's visit to the thermal spa at Hotwells near Bristol. Pope sought donations of mineral specimens and exotic shells from his well-heeled and well-travelled friends. Over 30 tons of specimens arrived with which his grotto was decorated. William Borlase sent minerals from Cornwall. Ralph Allen, of Bath, supplied 'alabasters, spars, and snakestones (ammonites)'. Petrified wood and mosses from Knaresborough, amethyst, bits of columns from the Giant's Causeway, and other such items were all incorporated. Pope introduced mirrors to direct sunlight reflected by the Thames to add 'sparkle' to his glittering assortment of mineral crystals. There was no pretence of scientific order in their arrangement.

The mansion was demolished in 1808, but the basement tunnels survive. The grotto is now 'dingy and weathered, but solid and remarkably intact', and is Listed Grade II, recognised by English Heritage as 'at risk' and in need of conservation. English Heritage has provided some funding with conservation in mind. A Pope's Grotto Conservation Trust has been established, and has contacted the History of Geology Group for expert assistance with, for example, identification of the minerals.



The site is now occupied by the Radnor House Independent School, which body has allowed some weekend and school holiday visits by volunteer HOGG recorders sufficiently proficient in mineral identification. The cited source includes a plan of the grotto, and historic and modern internal views.

SOURCE: HENRY, John, 2017, Pope's grotto. *Newsl. History of Geology Group* 59 (February 2017), 13 – 16b [The History of Geology Group is one of the specialist groups of the Geological Society of London].

Little used Chinese tube station is becoming a tourist attraction in its own right

Caojiawan station is a stop on Line 6 of Chongqing's Rail Transit service, in the southwest of China. It opened with great fanfare in 2015 and looks somewhat futuristic. But this subway station in China has one very bizarre aspect to it – it has been built on wasteland. It isn't even served by a paved road.

It is sitting among undeveloped land, surrounded by overgrown grass and raw terrain. The station can only be identified above ground by a disabled access lift and three entrances: 1, 2 and 3. The latter two are closed to the public via reinforced metal gates, but the first allows in the few passengers that use the stop.



One of the three entrances

Inside, once beyond the facade of the entrance, passengers – some of whom are said to reach the stop via a van service – are treated to a stunning lobby. Pristine, it gleams like a mausoleum and provides sharp contrast to the dusty, dirty outside. The ticket turnstiles are all brightly illuminated but few people pass through.

It's slightly baffling why the surrounds of the station



haven't been developed, especially as the CRT was painstakingly planned by transport experts in advance. But, either way, as well as being useful for a handful of commuters, it has become a destination point for locals intrigued by the apocalyptic-inspired sight. Serving more than 630 million people each year, the CRT is the world's busiest train network, originally opened in 2004. Line 6 was added in 2012.

SOURCE: *MailOnline*, 24 May 2017.

Underground chambers contain human remains at Tuam, County Galway, Ireland

A 'mass grave' containing the remains of babies and infants in an 'underground structure with 20 chambers' has been reported at the site of a former Roman Catholic mother and baby home at Tuam in County Galway. Reportedly over 800 children died at the home. DNA analysis suggests the remains date from the 1950s, and are of infants from 15 weeks to three years old.

An Irish Government investigation was commenced in 2014 as a result of a local historian finding death certificates for nearly 800 children, but only two matching burial records, suggesting unrecorded and unmarked graves. Suspicions were aroused as a result of boys playing at the site reporting a 'pile of bones' in a 'hidden underground chamber' in the 1970s.

SOURCE: GRIERSON, Jamie, 2017, Mass grave found at Irish Catholic care home. *The Guardian*, 4 March 2017, page 22.

Lost underground print works discovered on Plymouth Hoe, Devon

Hidden bunkers and basements used by an old printing press have been unearthed by builders working on a £5m housing development on Plymouth Hoe..

Plymouth firm West Hoe Developments is constructing a four-storey property block with a surgery on a patch of land that was used as a car park for 60 years. But it turns out the site plays a significant part in the history of city – the corner plot was home to international publishing firm W. Brendon and Sons Ltd, which was bombed during the Plymouth Blitz in 1941.



Due to the devastation of the city, many parts were scattered and buried. The site opened as a car park in 1945. Since contractors have been on site, they've found

six old pre-war printers, a steam engine, and remains of a printed Alice in Wonderland book. Old basements and bunkers used by the old publishers have also been found – which contractors initially assumed was a mystery tunnel leading to Drake's Island.

SOURCE: *The (Plymouth) Herald*, 21 June 2017.

Mapping the UK's underground

The uppermost layers of rock underlying the United Kingdom have been comprehensively exploited by the sinking of wells, driving of tunnels, excavation of mines and quarries, and digging of all sorts of subterranean cavities for sundry purposes. Many of these interventions are poorly documented or mapped, resulting in costly over-runs of, for example, large civil engineering projects, and they have implications for the security of much of the country's public water supply from underground sources.

The British Geological Survey, based at Keyworth near Nottingham, is now setting out to collect and coordinate all available information in a manipulatable database. BGS are building three-dimensional maps of the uppermost five kilometres of the subsurface called UK3D. This can be downloaded free from BGS.AC.UK and opened in Google Earth with rotating, tilting and zoom functions.

SOURCE: BEGGAN, Ciaran, 2016, Revealing the UK's hidden depths. *Planet Earth*, Winter 2016 / 2017, page 24 [*Planet Earth* is published by the Natural Environment Research Council].

British expat couple turn Spanish tunnels into luxury B & B

A British expat couple put their entire livelihoods on the line to turn a set of four tunnels into a unique bed and breakfast.



The tunnels before work started



One of the completed rooms in the luxury B & B

Decorator Mark and his former sales rep wife Shirley, from Edinburgh, bought a property for £21,707 in Andalusia, on the southern coast of Spain, which is also known as ‘cave country’. They successfully built themselves a house before setting their sights on becoming hoteliers by transforming the adjacent tunnels into a B&B in the hope that guests would pay £104 a night for the experience – bringing in a potential annual income of £17,363. They bored into the hillside to link the tunnels together to create a three-bed dream B&B. The couple hoped their new property would allow them both to slow down and support them financially in their later years.

Ploughing £78,000 into renovating the tunnels, they were forced to halt the project when they encountered major problems. Discrepancies in the deeds and the land registry meant not only did they not have planning permission, but the caves they were building weren’t actually theirs. For three months, the property stood still with their dreams threatening to collapse. The cave walls began to crumble without any support from the usual plaster that’s applied to stop this from happening.

At one time it seemed likely that the Spanish local authorities had the right to force them to demolish all of their building work. However after an anxious wait they were allowed to complete their ambitious build which was done in ten weeks allowing their new venture to be ready for the 2017 season.

SOURCE: *MailOnline*, 12 June 2017.

Under-road voids, Dublin, Ireland

Over 200 ‘underground archaeological features’ have been recorded under two of the oldest streets in Dublin, James’ Street and Thomas Street. These include 18th- and 19th-century coal cellars, and part of a post-medieval tanning pit.

SOURCE: GIACOMETTI, A., 2017, Dublin, James and Thomas Street. *Post-Medieval Archaeology* 50 (3), page 506 [Abstract]

Nottingham archaeologist finds his 152nd new cave in 12 months

Sonic Barbers, in Derby Road, has a 200-year-old cave below its cellar. It can be accessed through a hatch and was most likely used as a medicine store, Mr Lomax said. Hundreds of man-made caves dating back as far as the ninth century lie waiting to be discovered underneath Nottingham, the city’s archaeologist Scott Lomax has claimed.

Scott Lomax uncovered his 152nd new cave in the city in just 12 months in July. The cave has been found below the cellar at Sonic Barbers, in Derby Road. The cave, which is about 2m in height and about the same in diameter, had been partially filled with rubble, preventing safe access into it. Either side are rock-cut thralls, which are benches on which goods were kept, essentially shelves. The chamber would have been dug and used by the people

who lived there and was probably used as a medicine store. Nottingham is built on soft sandstone making it easier to dig into, but strong enough for structural stability.



Some homes in Nottingham are built into sandstone rock faces

While some people are aware of caves underneath their property, many had not been officially recorded and hundreds of undiscovered caves underneath shops and houses are waiting to be found in Nottingham. In the past many have been used to dispose of rubbish, making access difficult.

Derby Road has become a hotbed for caves and, while new ones are being found regularly, one spacious cave is the setting for a pub’s restaurant.

SOURCE: *BBC News* Nottingham, 22 July 2017.

English Channel power cables linking England to France

Times of peak demand for electricity in England and France do not coincide, so four pairs of 43 km cables allow current to flow in either direction as required to allow efficient use of generating stations, and to provide for continuation of supply in emergencies.

Half of the cables were damaged and taken out of use early in 2017 by a ship’s anchor dropped when two vessels collided during an 80 mph storm. The link supplies about 5% of the UK’s electricity consumption. Usually most power flows to England, but during the last three months of 2016 the UK was a net exporter to France as a result of nuclear power station shut-downs in that country.

Currently an additional power link is being constructed, routed through the Channel Tunnel. This is scheduled to become operational in 2020, with most energy imported to the UK generated in nuclear stations in France, and most exported from wind-powered installations. All UK stations burning coal are expected to have been closed by 2025, and a new UK nuclear station at Hinkley will be at work no earlier than that. Additional international cable connections to Norway and Sweden are expected to become available from the 2020s.

SOURCE: VAUGHAN, Adam, 2017, UK boosts electricity connections with France. Work begins on £495m cross-Channel cable. *The Guardian*, 1 March 2017, page 22.



Gilmerton Cove, Edinburgh, Scotland

It is not for want of trying that your scribe has failed to gain access to a small network of rooms and tunnels excavated in sandstone at Drum Street, Gilmerton, a short bus ride south of Edinburgh. Published descriptions conjure up images of similar places in Nottingham and even Reigate.

A suggested origin is eighteenth-century trial tunnelling in search of coal where, none being found, the cavities found a secondary use as a drinking den. An inspection in 2000 resulted in the conclusion that intensive secondary use has obliterated any original archaeological features that might indicate a primary purpose.



Members of the Grampian Speleological Group have arranged access from time to time, and most recently scientists from the Universities of Aberdeen and Edinburgh have employed ground-penetrating radar in a search of further and perhaps less defaced cavities. Evidence for a further chamber which may contain less compromised archaeology is hinted at. A small sketch plan of the rooms and tunnels made in 1968 accompanies the cited report.

SOURCE: ANON, 2017, Gilmerton Cove Research Project. *Bull. Grampian Speleological Group*, 5th Series, 2(2), page 10.

Fort Knox-style bunker offers mega-rich Brits a secure place to hide valuables

Britain's super-rich are being offered a place to hide their most valuable items – in a Fort Knox-style, bombproof bunker created in a former library basement.

The 10,000 sq ft underground facility, which cost £30million to build, is situated up to 40ft below ground and has one-metre thick ferrous-concrete walls. It has been designed to be virtually bombproof, fire-resistant and watertight and is aimed at people who need a secure facility following the Hatton Garden heist.

Wealthy clients looking to hide artwork, jewellery and other valuable or confidential items enter the bunker-style complex, called Armitage Vaults, through a discreet entrance off Bolsover Street, central London. After going through video entry security doors, they are led into a manned security room and loading bay. The bay opens on to a special goods lift which goes down to the subterranean facility.



The facility has 135 steel-lined, climate controlled units

The underground facility was previously used as the library, records office and storage centre for the Royal National Institute for the Blind. Built in 1920–21 to designs by Claude Ferrier, the complex stored the medical records, glasses and other products made for the blind and partially sighted. The depository also stored sight-testing equipment; embossing and print machinery for Braille and the first prototypes of the Braille alphabet and music notation.

SOURCE: *The Mirror*, 23 January 2017.

Global warming threat to repository designed to protect seed bank from the effects of climate change, Svalbard

The purpose of a tunnelled repository on the Norwegian Arctic island of Svalbard (Spitzbergen), opened in 2008, is the long-term preservation of viable seeds of the world's most important crop plants through global catastrophes resulting from climate change, sea level rise, and other causes. The idea is that if, anywhere or everywhere, agriculture is wiped out, the cultivation of food plants could be recommenced. Almost a million packets of seeds are stored at a temperature of -18°C (0°F).

The Svalbard repository is approached by a tunnel driven through what was thought to be permanently frozen ground (permafrost). Unfortunately global warming has resulted in the repository being threatened. After 'the world's hottest year' summer temperatures in the Arctic soared, and average temperatures on Svalbard were 7°C above normal in 2016.

Ice in the 'permafrost' started melting, and there was heavy rain when snow would normally have been falling. Meltwater started to flow into the 100m entrance tunnel, but fortunately did not reach the seeds' storage area. It was thought at the outset that the repository would not need to be permanently staffed or monitored, but it is now being re-engineered and its management plan revised.

SOURCE: CARRINGTON, Damian, 2017, Arctic stronghold of vital seeds flooded after permafrost melts. *The Guardian*, 20 May 2017, page 19.

[Editor's note: The Svalbard seed bank was featured in an article in *Subterranea* 29 (April 2012), page 76.]



NEWS – PUBLICATIONS

Wealden Cave and Mine Society publishes *Cave & Quarry 7*:

Out of sight and out of mind: subterranean industrial archaeology in Surrey

Some excellent and important site investigations, historical research, and site interpretation is being conducted and published by Peter Burgess and other members of the Wealden Cave and Mine Society. The Society is both a caving club, operating from a caving cottage in South Wales, and an industrial archaeology society concerned primarily with mines and other underground sites in east Surrey.

In addition to a members' newsletter *News of the Weald*, WCMS publishes an occasional journal *Cave and Quarry*, the seventh issue of which, for 2016, has recently been distributed. This is a splendidly presented printed document containing numerous black and white and colour photographs, plans and sections and the like. Of the 98 pages, all but 26 deal with the archaeology and history of underground sites in Surrey, all the work of Peter Burgess. The last 26 pages report a caving expedition to the Philippines.

Two papers deal with silver sand mines in Reigate. One discusses the several 'caves' either side of Tunnel Road (made in the years 1823–24) and their primary purposes and secondary uses, and dates relative to each other and to the tunnel (the oldest surviving road tunnel in the British Isles). The other presents contemporary newspaper reports relating to mine subsidences in Reigate. A third paper has contemporary reports of fatal accidents and a suicide at several mines (two of the deaths were underground).

Two reports describe the investigation of a well at Queen's Park in Reigate, and a major excavation revealing George Taylor's 1890s well and pump-house foundations at Colley Hill and the underground quarry found during the well sinking. Evidence for extensive opencast hearthstone extraction at Colley Hill is discussed.

A further paper speculates on the possible role of springs exploited during the Roman occupation in the discovery of building-stone resources and commencement of quarrying.

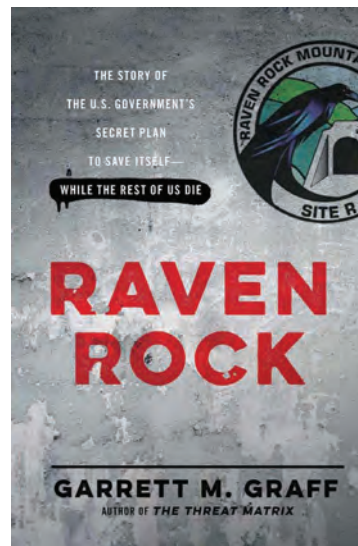
Shorter communications report investigations at Wonersh; a short tunnel of unknown date and purpose entered via a collapse in a garden in Dorking; a 'sand cave' on the south side of Reigate High Street; and the investigation of a World War II air-raid shelter for a school at Earlswood.

The Wealden Cave and Mine Society, based in east Surrey, is, as its name suggests, a combination of traditional caving club and group dedicated to man-made mines including underground quarries. Since 1992 WCMS has published seven issues of its journal *Cave and Quarry*, the latest, consisting of 98 pages including

numerous colour photographs, was dated last year but only recently circulated.

With the exception of a report on a mainstream caving visit to the Philippines, the whole of this issue is devoted to a series of reports by Peter Burgess on archaeological excavations and historical researchers concerning sites in Surrey. There are short reports on investigations at minor sites such as a short tunnel at Dorking, sub-surface cisterns and a reservoir at Wonersh, and a school air-raid shelter at Earlswood.

Raven Rock by Garrett M Graff



This is a book that chronicles the US reaction to atomic and thermonuclear weapons and the work undertaken to maintain government and ensure the chain of command (civilian and military) would survive. The period covered is from the closing days of WWII to after 9/11.

It describes that facilities developed – many of which are underground – and the arrangements for continuity of the office of President in the event of a nuclear attack on the US, which of course became increasingly more complex as atomic weapons carried by bombers were replaced as the primary weapon system by ICBMs and then submarine-carried weapons systems.

There is a very interesting section on how all the pre-laid plans fell apart on 9/11 – partly because of the reduction of preparatory exercises to ensure that the information held was up-to-date and that the plans actually worked. On 9/11 most of them did not.

SOURCE: Brian Matthews

Der Erdstall 43

Subterranea Britannica, established in 1974, was modelled on two pre-existing societies, the *Société Française d'Etude des Souterrains* in France, and *Arbeitskreis für Erdstallforschung* in Germany. All three societies continue to flourish, but have developed quite differently.

Subterranea Britannica has widened its interests from antiquarian concerns with secret tunnels, garden follies, ice-houses, and so forth, to include mines and quarries,



canal and rail tunnels, military works and Cold War structures. Our French sister society has moved a little way in the same direction, including especially underground quarries within its range of interests. In Germany, the focus is still very firmly on small rock-cut underground spaces of former ages, and mostly those in Bavaria and neighbouring Austria.

Subterranea Britannica exchanges journals with both sister societies, so we have more or less complete sets of *Subterranea* from France, and *Der Erdstall* from Germany.

The latest issue of *Der Erdstall*, for 2017, has recently arrived, and contains (in German of course) about a dozen underground sites. The magazine has always been impressively produced, the latest issue of 133 pages containing colour photographs, maps and plans, and archaeological records including drawings of artefacts recovered from sites.

Since 1974 we have of course formed alliances and exchange agreements with similar societies in several other European countries, notably Belgium and the Netherlands, and we hold sets of their publications too.

NEWS – TUNNELLING

Crossrail to have ‘silent track’ below planned new concert hall, London

Crossrail, otherwise the Elizabeth line, passes 17 metres below the Barbican where a new concert hall is planned for the London Symphony Orchestra. To minimise or eliminate noise and vibration caused by 90mph trains disturbing concerts, a section of ‘floating track’ is to be installed at this location.

SOURCE: WATTS, Matt, 2017, Engineers build ‘silent track’ for trains below Rattle’s orchestra. *Evening Standard*, 22 May 2017, page 4.

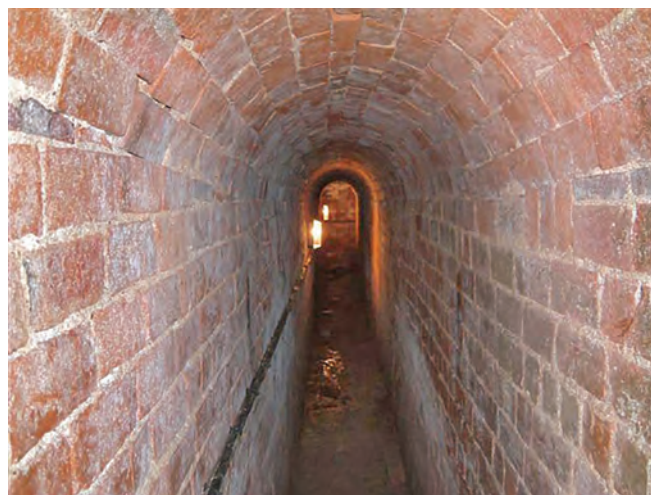
Tunnels beneath Croome Court near Worcester open to the public

Families are being encouraged to experience 200-year-old tunnels beneath one of Europe’s largest privately owned Walled Gardens at the National Trust’s Croome Court, near Worcester.

Rescued from ruin by owners Chris and Karen Cronin, the tunnels have only recently been restored as part of a larger self-funded restoration project of greenhouses, borders and working vegetable plots.

The red-brick heating tunnels, which run underneath the glass houses, are a great example of the ingenuity and pioneering spirit that existed within the Walled Gardens during the early 1800s. Since that time technology has moved on a great deal and the tunnels have become redundant, at least as far as their intended purpose goes.

The tunnels were originally constructed to protect and maintain the hot water pipes which carried heat from the boiler house and distributed it to the array of nearby glass houses. Approximately 35m long, the main tunnel can be walked through in less than a minute. Visitors



don a hard hat and descend a flight of steps in the now fully restored fig house. Winding their way through the dimly lit tunnels, which can be a little narrow and low in places, they come up in the boiler house.

The tunnels were recently featured in a *Time Team* TV documentary about Croome. The Walled Gardens will be open every Friday, Saturday, Sunday and Bank Holiday Monday until the end of September. The Walled Gardens open from 11am and close at 5pm with last entry at 4.00pm. There is an entrance fee of £5. All the money raised from the entrance fee is used to help with the costs of restoration.

SOURCE: *Worcester News*, 28 July 2017

Thameslink trains could be an ‘exhibit’ at the new Museum of London at Smithfield, London

The relocated Museum of London, due to open at Smithfield in 2022, will be alongside the Thameslink railway tunnel to the south of Farringdon Station. It has been proposed to incorporate the railway into the museum displays, with a glass wall between the trains and the galleries. Museum visitors will be able to watch the passing trains, and passengers will catch a glimpse of the museum.

SOURCE: DEX, Robert, 2017, Catch that train at new Museum of London. *Evening Standard*, 10 May 2017, page 22.

New Northern line tunnelling commenced in March 2017, London

Two 650 ton tunnel-boring machines, Amy and Helen, are being employed to drive the two 3.5 metre diameter parallel Northern line extension tunnels the 3.2 km between Kennington and Battersea via Nine Elms. The TBMs are named after Amy Johnson, the pioneer aviator, and Helen Sharman, the astronaut.

There will be new subsurface stations at Nine Elms and Battersea. The machines will bore up to 100 feet daily, the total of 3.2 km being expected to be completed by the end of 2017. The extension is scheduled to be opened to traffic in late 2020 with services from the Charing Cross branch of the Northern Line running through from Kennington to Battersea. More than 300,000 tonnes of





Tunnelling at Kennington

tunnel spoil will be removed to shafts by conveyors and taken by barge to East Tilbury to create arable farmland. SOURCE: PRYNN, Jonathan, 2017, Work on new Northern line tunnel starts in March. *Evening Standard*, 20 January 2017, page 9 and ANON, 2017, Northern line tunnelling in March. *Modern Railways*, March 2017 and May 2017, page 20.

Unfinished prison escape tunnel found in Mexico

Mexican authorities have found a tunnel that connects a timber house with a state prison and two holes that were being used to store weapons, drugs and other contraband. The authorities started a search operation after noticing an unusual earth movement in the prison of Reynosa, located in the northeastern Mexican state of Tamaulipas. With the help of new technology, they found the unfinished tunnel in the timber house near the jail. The tunnel entrance was covered with wooden boards and bricks to avoid being discovered. The tunnel was 16 feet deep, 45 feet long and 4 feet wide.



The Public Security Secretariat said that after the tunnel was discovered, there was a special police operation to regain control of the situation.

During this police search, they say they found other holes that had been dug to store drugs, weapons, mobile phones, beer, tequila and whisky bottles, construction tools, knives and even a torture table. The prison has 1,610 inmates, among them 1,546 men and 64 women. SOURCE: *MailOnline*, 16 May 2017.

New tunnel opened in Kent

The Hermitage Quarry near Maidstone, a large opencast mine for Kentish ragstone, has been provided with a new 100m access tunnel to avoid quarry traffic affecting a public right of way.



SOURCE: ANON, 2017, Kentish ragstone. *Outcrop 55*, page 9, Kent: 100m access tunnel opened to serve the Hermitage opencast ragstone quarry near Maidstone. [*Outcrop* is published by the West Sussex Geological Society.]

Proposed second railway tunnel at Lewes, Sussex

Proposals for duplication of the London to Brighton main railway line have not been endorsed by a recent consultants' report commissioned by George Osborne when he was Chancellor of the Exchequer. The existing main line, opened in 1841, is now operating at its maximum capacity. Apart from, as in 1841, conveying trains between London and Brighton, this line now serves Gatwick Airport, and direct services to and from south coast destinations from Southampton as far east as Hastings. Originally with two tracks throughout, much of the line has been widened to four tracks wherever economically possible. However two of the three long tunnels (Balcombe and Clayton) and the Ouse Valley viaduct remain as double-track bottlenecks. The third long tunnel, at Merstham, was duplicated in 1896–99 by the construction of a high-speed line bypass from Coulsdon to Earlswood. Station platforms have been lengthened to accommodate twelve-coach trains wherever possible, to maximise capacity. Double-deck trains are ruled out as bridges are too low and tunnels too narrow to accommodate them.

There is strong local support for reopening the through route via Oxted and Lewes. Proposals include a new tunnel under the South Downs at Lewes to allow trains from Brighton to continue to London without reversing at the main station, and reopening the former line between Lewes and Uckfield.

There is the additional problem of routing trains into a London terminus beyond Croydon. Reopening the former Woodside & South Croydon Railway, closed in 1983, has been suggested. However part of this line including the three tunnels under Park Hill is now used by Croydon's trams.

SOURCE: ANON, 2017, Study dismisses BML2 plan. *Modern Railways* 74(823), page 8.

Abandoned rail tunnel in Northants to be used as car test bed

Six years after its first conception, planning permission was granted in February by Daventry District Council, for the Catesby Aero Research Facility to proceed.

The project is a collaboration between TotalSim Ltd and ARP (Aero Research Partners). The facility will create a world leading test facility within the Northamptonshire area, providing aerodynamic and aeroacoustic analysis at the highest level.

Catesby Tunnel is a 2.7km long, disused and partially derelict relic of the railway age. Once suitably remodelled for the task by the installation of a smooth asphalt roadway, lighting and end closures amongst other substantial upgrades, the enclosed body of undisturbed air within the original tunnel structure provides an ideal measurement environment for vehicles moving at speed. The tunnel forms an exceptionally repeatable tool and will be the only facility of its kind in Europe. Unusually for 'proving ground' type facilities, the Catesby Aero Research Facility (CARF) is intended to be commercially available for hire by any customer wishing to evaluate the aerodynamic characteristics of their vehicles. Customers are anticipated to range from cycling teams to motorcycle manufacturers, race car teams to road car enthusiasts, light vans and truck aftermarket vendors to major motor manufacturers and OEMs, and will include governmental and non-governmental organisations.



A LNER 04 emerges from the tunnel in 1949

In addition to the test facility itself is a development within the old station yard. This will consist of two office buildings, ten workshop units, and a building used by research students from Coventry University and The University of Northampton. The buildings will all be associated with CARF, and will bring employment within the motor industry to the Daventry area.

The next stage in the adventure is to secure the funding necessary to get the project completed. It is anticipated that the build phase will take approximately two years.

SOURCE: TotalSim Ltd, 23 February 2017.

Guided visits to the Glenfield tunnel on the Leicester & Swannington Railway, Leicestershire

This single-track railway tunnel, just over a mile long, opened in 1832, and closed in the 1960s. It was in 1832 the world's longest railway tunnel. Its primary purpose was the conveyance of coal trains from mines in northwest Leicestershire to the West Bridge Wharf at Leicester. In due course it formed part of the Leicester & Swannington Railway. The 13 shaft tops are all Listed.



The west portal of Glenfield Tunnel in March 1967 after traffic had ceased

The tunnel is owned by Leicester City Council, who allow conducted visits to the Glenfield end of the tunnel: for details contact the Leicestershire Industrial Archaeology Society. SOURCE: PEARCE, David, 2017, Glenfield tunnel – in 1832, the longest railway tunnel in the world. *Industrial Archaeology News* 180, pages 1 and 3.

[*Editor's note:* The tunnel was visited by members of Subterranea Britannica on 15 July. A report on the visit will be published in *Subterranea* 46.]

Isambard Kingdom Brunel's birthday and the Box tunnel

The notion that Isambard Kingdom Brunel (1806–1859) designed the Box tunnel for the Great Western Railway to allow the morning sun to shine right through from end to end on his birthday was, apparently, first published in 1842 in the *Devizes Gazette*. Both the alignment of the tunnel and its gradient would have to be exactly right for the sun's rays to penetrate the whole length of the bore. The tunnel was designed by Brunel and made under his direction in the years 1836–1841. It has a length of 3212 yards and is inclined downwards to the east. It lies between the sites of the now closed Corsham and Box stations, Chippenham and Bath Spa now being the nearest stopping places.

To have measured the exact compass bearing and height of the sun above the eastern horizon on Brunel's birthday, 9 April, and to drive a tunnel precisely to be aligned with it on that date, especially as the railway gradient is downwards rather than upwards to the east, would have required some skill.



As the main line to Bristol was closed to traffic for engineering work on 9 April 2017, the Great Western Railway and Network Rail took the opportunity to find out if the sun really does shine right through as supposed. Teams assembled at both ends of the tunnel, the day being fortuitously one of the brightest of the year.

Sunshine streamed into the east portal. But did it reach the other end? Observers there could indeed see that the sun had risen, but it seems direct rays failed to reach them. Perhaps the globe was a trifle too high or too low in the sky relative to the tunnel bore. An opinion was voiced that earlier observers may have seen a reflection of the sun on water lying on the track which is now well drained and kept dry. Brunel may well have had commemoration of his birthday in mind when designing the tunnel and, if so, got the alignment almost but not quite exactly right. SOURCE: MORRIS, Steven, 2017, Attempt to shed light on rail tunnel legend. *The Guardian*, 11 April 2017, page 13.

100 Brazilian prisoners escape through 90 ft-long tunnel

Almost 100 inmates escaped from a jail in Brazil after digging a 90ft tunnel under the prison walls, it has emerged. Guards at the Parnamirim State Penitentiary in Rio Grande do Norte found the tunnel and the empty cells in the early hours of the morning. They also found piles of clothes by the exit to the hole after prisoners discarded their uniforms, changed into civilian clothes and sprinted off to wait at a nearby road for getaway cars to ferry them away from the jail, according to local reports.

More escapes were only thwarted when the heavily armed Military Police surrounded the jail and sealed the tunnel. According to reports, nine of the inmates have been found, while police are attempting to catch the remaining 82. Parnamirim prison was hugely overcrowded with 589 detainees in a facility designed for 382, according to figures from local judiciary services.



The would-be escapee stuck in the excrement-coated tunnel
Last year another attempted Brazilian tunnel jail break was less successful. In a high security prison, there are few escape options available – with concrete walls and metal bars designed specifically to keep criminals from getting loose. One luckless inmate thought he had found

a possible way out by slithering headfirst into the sewage tunnel under the toilet. The prisoner appears to have had some success getting to the first bend in the pipes, before he got into difficulty. Sadly for him, he was soon well and truly stuck down the excrement-coated pipes, with his upper body getting wedged down the tunnel.

After desperately trying to wriggle himself to freedom, the man finally admitted defeat and called for help. By gripping onto his extremely skinny legs, two men managed to pull the prisoner back out of the tunnel and into the toilet.

SOURCE: *MailOnline*, 26 May 2017 & *Sunday Express*, 6 January 2016

Canal news from Dudley, West Midlands

The Dudley Canal Trust and Dudley Canal Trust (Trips) Ltd are being amalgamated into a single organisation, the Dudley Canal and Tunnel Trust. Based at a canal basin alongside the Black Country Museum, the Trust runs canal boat trips through the Dudley canal tunnel and into the linked limestone mines. Both the museum and the tunnel / mine trips are highly recommended.

Subterranea Britannica has organised Study Weekends based in the Black Country several times, and members have been impressed by developments at both sites. Sadly, we learn that Vic Smallshire, our contact at Dudley, died recently.

SOURCE: *The Legger* 241 (Autumn 2016) and letter from Richard Jones (Membership Secretary).

Revived proposal for a rail tunnel under central Manchester

Transport for Greater Manchester is to consider the feasibility of providing tunnelled Metro services under the city, thus re-examining an early 1970s proposal for a rail tunnel to link the Manchester Piccadilly and Manchester Victoria stations. That scheme was abandoned on cost grounds in 1977.

SOURCE: TRANSPORT FOR GREATER MANCHESTER, 2017, Picc-Vic reborn? *Modern Railways* 74 (822), page 11.

Plans for a new tram tunnel under the Thames

Proposals for a £600 million privately funded tram system linking north Kent with Essex have received cross-party support.

With London Paramount and Ebbsfleet Garden City on the horizon but the Lower Thames Crossing at least a decade away, proposals have been drawn up for a new public transport system to connect north Kent and Essex. People hoping to get across the Thames without the use of a car must use either the X80 bus service between Bluewater and Lakeside or the ferry between Gravesend and Tilbury, which combined, make up around 1% of the total traffic using the Dartford Crossing.

The £600 million KenEx Thames Transit is designed to relieve pressure on the often congested crossing, combat air pollution, and boost the economy on both sides of



the river. It is the brainchild of financial accountant Gordon Pratt, who previously worked with the London and Southern Counties Railway Consortium to come up with Brighton Main Line Two, a planned second railway connecting Brighton with the capital.

Mr Pratt believes KenEx Thames Transit would take about 10% of the traffic away from the Dartford Crossing, which falls just short of the 14% Highways England believes the Lower Thames Crossing will divert. KenEx Thames Transit would carry an estimated 58 million journeys to Bluewater each year – 36 million to London Paramount, 53 million to Lakeside, and 2.5 million to Ebbsfleet International.

SOURCE: *KentOnline*, 29 May 2017.

Tunnel network discovered under shopping centre in Dartford, Kent

Subsidence fears forced the Primark store in Dartford, to carry out emergency repairs to its store following the appearance of a sink hole in the car park in May. It was caused by an unknown network of tunnels believed to be of WWII or WWI origin. It is the second time in three years that the ground has sunk because of the tunnels. The network of passages was discovered when a sinkhole opened up in 2015 and led to emergency repair work being carried out.



Photo from Thanet Hidden History

When the company that owns the shopping centre submitted a Freedom of Information request to the Ministry of Defence in 2015 asking for details of the tunnels and their previous usage, the Government said it held “no information” on the issue.

The Primark store re-opened at the end of July with many shoppers unaware they were walking above a hidden network of tunnels.

SOURCE: *Independent*, 1 August 2017

The world’s most capacious tunnel, for sea-going shipping, to be driven in Norway

The southwest coast of Norway has long proved challenging for sea-going ferries on account of rocks and capricious currents. A short cut for sea-going vessels, avoiding difficult waters, is now to be provided by driving

a 1,700 metres long tunnel through the narrowest part of the Stadlandet peninsula. The Stad ship canal tunnel is to be 37 metres high and 26.5 metres wide. Work is expected to commence in 2019, with completion in 2023. SOURCE: ASSOCIATED PRESS, 2017, Norway to build the world’s first tunnel for ships. *The Guardian*, 4 April 2017, page 18.

FUTURE NEWS

For your diary

Information about a couple of forthcoming underground conferences in Europe, both of which combine presentations and visits.

1) The 40th SFES (*Société Française d’Etude des Souterrains*) Congrès will take place in Laon from 20–22 October 2017. Laon is just over two hours’ drive from Calais and the theme of the Congrès is ‘Underground Space in War and Subterranean Warfare’. Visits will include sites used in conflicts from the 13th to the 20th century and some local mines.

A number of Sub Brit members visited the SFES Congress when it was last held in Laon 16 years ago. The quality of the presentations, visits and food was superb. One site that is particularly moving is the Caverne du Chemin des Dames – an extended stone quarry that was used by both sides in WWI, sometimes simultaneously. Internal walls were built to provide an underground front line.

More information and booking details are at



www.subterranea.fr/congrès-2017/

Caverne du Chemin des Dames. Photo Paul Arps

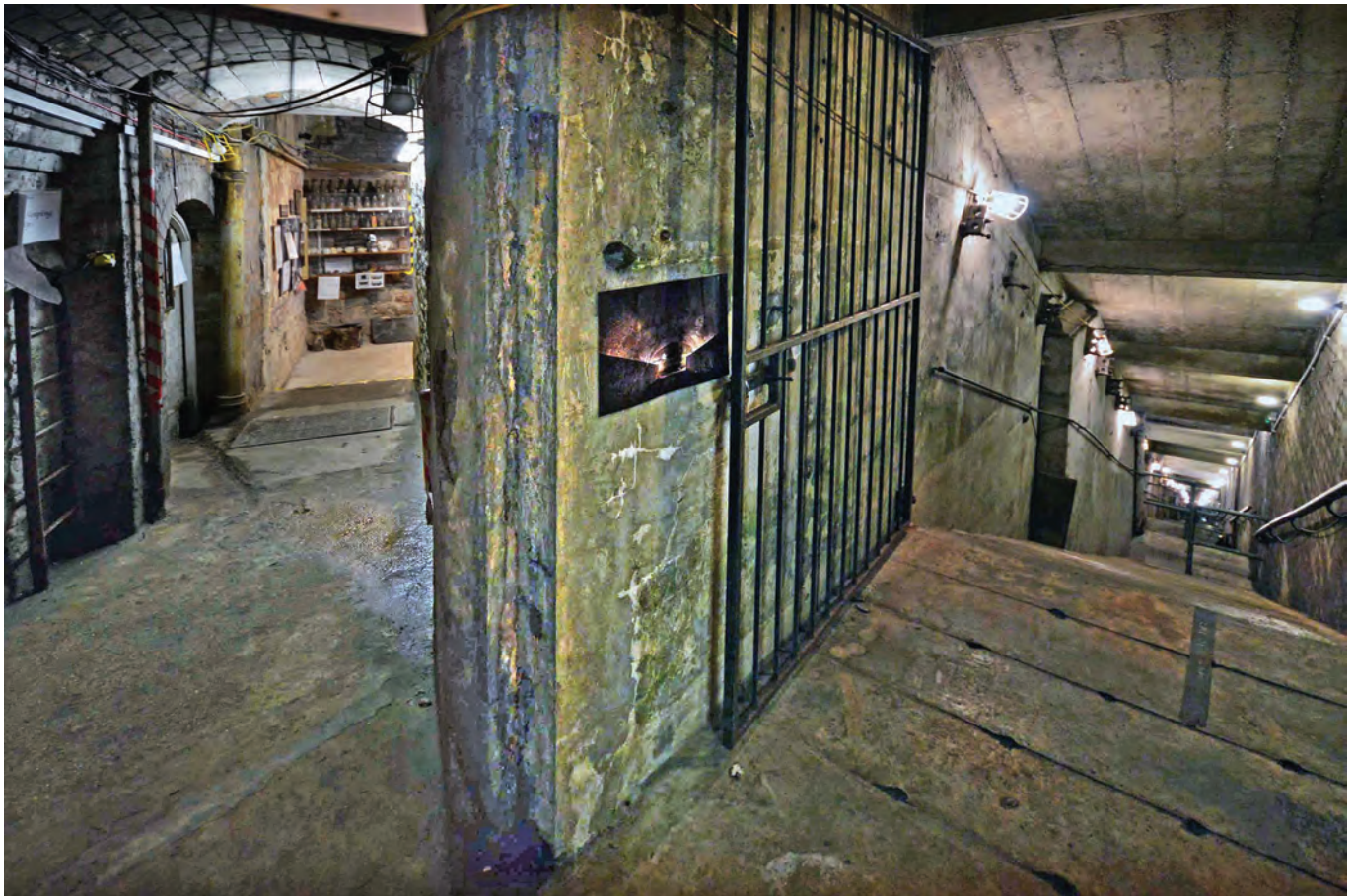
2) A website with early booking details for the 3rd International Congress of Artificial Cavities has been set up at www.hypogea2019.org/. The event will take place in Dobrich, Bulgaria, from 20–25 May 2019. A long way ahead, but the organisers are making an early call for papers and presentations. All presentations at the Hypogea will be in English so it would be good to get a decent Sub Brit turnout. Sites to be visited will include rock-carved churches and monasteries, cave dwellings and quarries.

SOURCE: Martin Dixon.



Sub Brit Visit to Clifton, Bristol, March 2017

Chris Rayner



The top of the south side steps to the right, and the original Rocks Railway Waiting Room and a wartime First Aid Post on the left

The vaults within the Leigh Woods abutment to Clifton Suspension Bridge and the Clifton Rocks Railway have many differences, but also some similarities which are less obvious. One link between them is that they are dark (or would be with the lights out) and also semi-buried, and that's probably the main reason why 24 Sub Brit members gathered on a chilly but sunny March morning in Clifton, on the west side of Bristol.

of his suspension bridge across Clifton Gorge, and it's not obvious at first glance that there is any internal space. We are not alone in not recognising this though, as the knowledge that the abutment was hollow was lost for nearly a century and a half.

The story of the Clifton Suspension Bridge begins in 1753 when William Vick, a wealthy merchant, left £1,000 in his will to build a bridge at this spot. He had some foresight: Clifton would become a prosperous suburb of Bristol during the next eight decades and the growth of the city itself would make a gorge crossing here a high priority. The location was the obvious one, as this was where the potential span was least, but the engineering challenges in spanning such a gap were, for that time, formidable.

Brunel 1, Telford 0

By 1829, that original legacy had increased with interest to £8,000, and the Trustees thought that the time was ripe to hold a design competition. That didn't settle matters, requiring a second one to be held a couple of years later in 1831. A number of engineers were approached but two would be particularly prominent in this process.

Thomas Telford, who had recently built the Menai Straits bridge, was one, and although he was not one of the original competitors, he became involved when



Clifton east abutment tower in foreground with the west Leigh Woods abutment beyond at the far end of the bridge

The Leigh Woods abutment, on the western side, was built by Isambard Kingdom Brunel to shorten the span



approached by the judges after they failed to agree on a winning design for the first competition. Telford grandly said a span of 580ft (176m) was the maximum possible, and then came up with his own design that had two tall gothic-inspired towers on the mudbanks of the gorge which perfectly reduced the span to his magic number. It was not a thing of beauty by any means, but it looked, for a short while, as though he would be appointed.

He had reckoned without the indefatigability of Brunel, though. Brunel's refusal to give up on the project was remarkable. He put in four entries for the first competition but still didn't win, and then when the judges seemed to be on the point of commissioning Telford to carry out the project, Brunel immediately countered with a new design that he claimed would cost £10,000 less. That led to a second competition and when another practice won, Brunel still wasn't daunted and eventually persuaded the judges to appoint him instead.

His design was for a suspension bridge with a longer span (700ft / 214m) than Telford had said was possible, and he achieved this by building two brick abutments on either side of the gorge. The one on the Clifton side was minimal because the cliff was nearly vertical here, but at the Leigh Woods end, on the west side, a much more substantial brick abutment was needed. These abutments would be the bases for the two towers from which the bridge would be suspended.



Clifton Suspension bridge seen from the south, with the Leigh Woods abutment under the left hand tower

It looked like he was there when they started work in 1831, but in a matter of days there were riots in Bristol about electoral reform, and local business confidence was so badly damaged that work stopped for five years. Work on the abutments resumed in 1836 but then the contractors became bankrupt the following year. New contractors were appointed and work resumed, but finally in 1843 funds ran out and the project once again ground to a halt. This time there would be a break of nineteen years.

Brunel saw the completion of the abutments and the towers but sadly died before work was resumed in 1862. The long hiatus led many to think that the project would

never be completed, and some even called for the towers to be demolished.

Tying the Knot

There was not complete inactivity at the crossing site though. As a first step in spanning the gorge, a one-and-quarter-inch diameter cable had been strung across it. This would be the only aerial crossing for the next two decades and was used in a similar way to a breeches buoy, intrepid travellers paying five shillings for the privilege of crossing in a dangling basket. They would get halfway across with the help of gravity and then get winched up the remaining length of cable.



Access ladder down to entrance chamber entrance recently cut by the Bridge Trust through the 2m thick red sandstone abutment wall

A bridegroom thought this would be the ideal wedding gift for his new wife but the voyage turned out to be a little more involved than he'd expected when the winch rope broke as they were being hauled up the other side. They were left hanging for several hours before a way of rescuing them was set in progress. History doesn't record what they talked about during those hours as they waited.

The project resumed in 1863 when new funds were raised by fellow engineers who wanted to complete the bridge as a fitting tribute to the late Brunel. In the intervening period the wrought-iron chains that had been made to carry the bridge had been sold off, but they managed to obtain the redundant wrought-iron chains from London's old Hungerford Bridge which was at that time being replaced.

These chains were connected up in parallel series and run over the towers at each end of the bridge and then buried deep in the ground on the far banks, anchored in 83ft / 25m-long tapering tunnels and plugged with brick to prevent them from being pulled out.

Where the chains run over the towers, they rest on saddles comprised of rollers, to allow the bridge to move as the weight on it changes with passing traffic and with the wind. It was quite a surprise to stand at the edge of the bridge platform and see how much the roadway would deflect as cars went over.

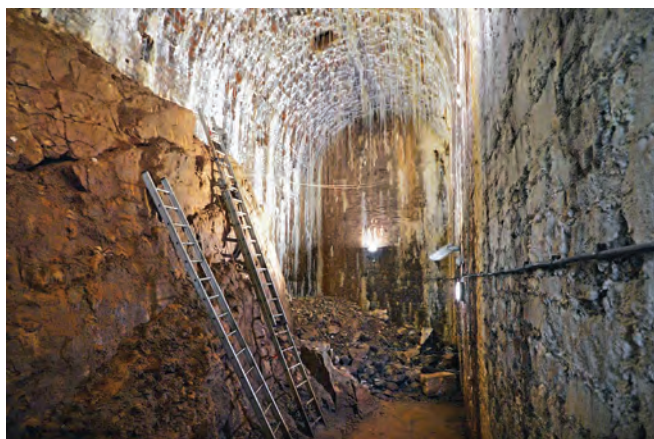


The Leigh Woods tower has a nice Latin dedication at its top: *Suspensa Vix Via Fit* which roughly translates as “a suspended way made with difficulty”; a reference to the original benefactor and providing something for the workmen to have a good chuckle about.

When the bridge platform was eventually built, it was subjected to a load test where 500 tons of material was placed at the centre of the bridge and the deflection was measured. This came within the design parameters and, when the loading was removed, the bridge returned to its original position. A remarkable achievement considering the materials and engineering design knowledge at the time.

Under the Bridge

The Leigh Woods abutment is in fact hollow, and contains vaulted chambers on two levels, seven vaults on the upper level and five beneath them on the lower level. The extra two vaults on the upper level are on the west, landward side and come about because of the gentler gradient away from the cliff edge. These two are rectangular in plan with barrel-vaulted roofs, and are aligned parallel with the gorge sides. The most westerly of these is curtailed by the rising ground surface, while the other one, possibly the largest in terms of volume, is the one we first entered as we were led into the abutment interior through a new specially cored opening.



Inside the entrance chamber, declared proudly by our guide to be three double-decker buses high, showing some of the original bedrock that the vaults were built around

The other ten gorge-side chambers are on two floors, five above and five below, and the floors are identical apart from the intrusion of the cliff face into the west side of the lower level chambers. Each floor is symmetrical in plan, a central, long rectangular transverse chamber facing the gorge (this was the second chamber we entered, on the upper level) with two pairs of smaller chambers on either side. These smaller chambers are ovoid in plan and apparently have domed brick roofs.

Between these smaller chambers is a central ring passage and a vertical shaft connecting the two levels. There is also a tight crawl space, circular in section, running from the central transverse chamber to this ring between the two outer chambers. Unfortunately we weren't allowed to explore this, but one could see that, once one had

slithered up a couple of feet through the brick wall from the central transverse chamber, there was a vertical shaft with the top of a ladder visible.

This was the start of the vertical shaft leading down to the lower level. If one wanted to visit the two outer chambers instead, one would have to crawl across the vertical shaft to get into the ring passage, and thence into one of these two outer chambers. The Clifton Bridge website has an interesting video clip showing their survey team accessing these lower chambers.



Inside the transverse chamber (the second one visited) looking east, showing the scale of the vault, the numerous straw stalactites, and side platforms leading to crawl holes though to the outer chambers

It seems bizarre that the vaults could have been forgotten about, but that has been put down to the two-decade break in construction in the mid-nineteenth century, during which records must have been lost. Even so, the likelihood of the abutments being hollow must have been in the minds of the bridge's inspecting engineers in the intervening period. An attempt to check whether voids were present in the abutment was made in the 1990s but they unluckily hit a spot between chambers which was solid brickwork, giving them a false reading.

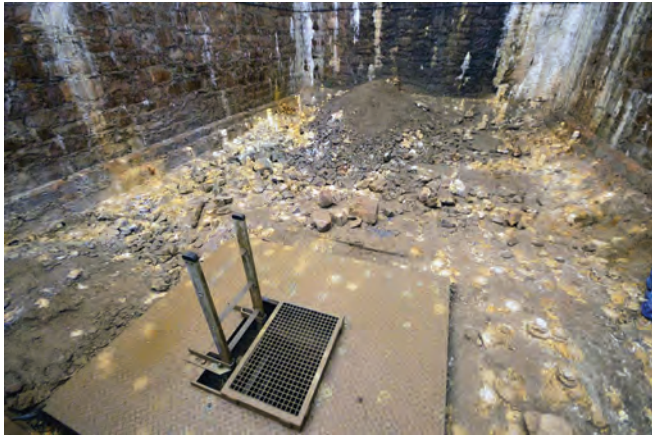
Straw Stalactites

The discovery of the vaults came about by accident when, in 2002, a 15m-deep hole was found by workmen under the roadway at the western end of the bridge. Coming down into a large chamber (the one that we first entered on our visit) the contractors were amazed by the scale of the space. They could not find any timber scaffolding from the original construction of the vaults, so all of this must have been removed by the vault builders in the 1850s. The contractors said that the air was good and that there was no smell, nor any dead animal remains.

They also reported 30ft (approx 9m) long stalactites. The rapid growth of stalactites was a surprise to them, because many believed at that time that stalactites grew at a rate of one inch per century. These are technically “straw stalactites” however, where the lime-bearing solution passes down a central void and deposits material at the bottom lip of the straw, and also of course on the ground below where much smaller stalagmites have formed.



In these stalactites, the internal diameter of the straw is exactly equal to the diameter of the water drop.



Manhole access in transverse chamber floor leading down to roof of lower level chamber (stalagmites forming more slowly on the floor adjacent)

In the roof of the first chamber we entered we could see the manhole that the 2002 contractors had used to gain entry, which is now once again concealed at surface level by road metalling. One can also see recesses in the walls where the original roof-vault form work had slotted in. Within the central transverse chamber there are also several metal bolt heads on rotten timber packers, because Brunel had provided tie bars to restrain the outer chambers. The use of timber packers is odd, suggesting that it was a short-term solution that could have been bolstered up if there had been any early evidence of lateral movement. It seems unlike Brunel to build in a problem for the future. As the timbers packers have now largely rotted, and the bridge's current engineers have found no evidence of movement in the outer walls, these tie bars must have been an additional factor of safety that Brunel provided, just in case.

The ties are only across the outer chambers and don't continue across the central transverse chamber, so presumably Brunel relied on the walls between central chamber and outer chambers to restrain any movement. All too soon it was time to leave the vaults and climb back up again to the Interpretative Centre where the two parties of Sub Britters were reunited. The Bridge Trustees have limited vault visits to a maximum of twelve persons other than their guides at any one time, hence the two Sub Brit groups. This limit appears to be strictly enforced, although a recent performance inside the first vault of the play *Orpheus and Eurydice* stretched a point by allowing in the four-person cast in addition to the audience of twelve. Before descending into the Rocks tunnel we also had time to explore St Vincent's Cave on the cliffs above the Avon Gorge. Unfortunately only one of the Sub Brit parties had time to visit this local tourist attraction.

The Giants' cave

According to old Bristolian folklore, Bristol was once home to two giants, Goram and Ghyston. The giants lived in a high cave, overlooking the river. History tells how

the cave was part of a small chapel in 305 AD; it was accessed from the cliff top. Romano-British pottery has revealed that it may have been a holy place and place of refuge. During the seventeenth century it is believed that it was home to a man living in religious solitude.



This gives an indication of the size of St Vincent's Cave, thought by early residents to be the home of two giants, Goram and Ghyston. During the 17th century it was home to an anchorite, a religious recluse

On the cliff top above the cave a windmill for grinding corn was erected in 1766; it was later converted for grinding snuff. The mill was damaged by fire in October 1777, when the sails were left turning during a gale and caused the equipment to catch alight. The building remained derelict for over 50 years until 1828 when William West, an artist, rented the old mill for 5 shillings a year, as a studio.

Observatory and camera obscura

West installed telescopes and a camera obscura, which were used by artists of the Bristol School to draw the Avon Gorge and Leigh Woods on the opposite side. Many examples of these paintings can be seen in Bristol City Museum and Art Gallery. The pictures which originated from images within the camera obscura he called 'photogenic drawing' and were based on the work of pioneer photographer William Fox Talbot.



St Vincent's Cave (aka Ghyston's or Giants' Cave), accessed via a steep tunnel running from beneath the Clifton Observatory. This tunnel was completed in 1837 to provide an airy lookout onto the gorge prior to the bridge being built

A 5" convex lens and sloping mirror were installed on the top of the tower; these projected the panoramic view vertically downward into the darkened room (*camera obscura*) below. Visitors could view the true image (not a mirror image) on a fixed circular table five feet in diameter with a concave white metal surface, and turn the mirror by hand to change the direction of view.



SubBrit member Richard West, having just limboed down the 60m long tunnel to St Vincent's Cave, now prepares to climb the final steps up to the lookout point

St Vincent's Cave

In 1835, William West began excavating a tunnel to the cave below. It took two years for him to complete the steeply inclined tunnel which is 200 ft in length. The cave opens out on the cliff face, 250 ft above the Avon gorge and 90 ft below the cliff top. A platform with a chest-high modern railing allows visitors nowadays to walk out above thin air and see the bottom of the gorge through a grid beneath their feet, allowing spectacular views of the suspension bridge and river below.

The Clifton Rocks Railway

Back on the east side, our destination for the afternoon was the Clifton Rocks Railway, conveniently positioned only a couple of hundred metres away from the bridge. The railway, a funicular, was associated with travel in a different direction, in this case down the slope of the gorge rather than across it. Here the two Sub Brit groups once again parted, one group starting at the top of the



The surviving entrance steps to the Rocks Railway ticket office (originally there was also a second set that ran from behind the camera)

railway tunnel, while the second group descended to the former low-level station to start there.

The Sub Brit website has a very thorough account of the railway and its history, so this report mainly picks up on some of the items our guide mentioned and some general impressions.

We heard how the railway had come into being, having been built between 1891 and 1893 as an underground funicular railway connecting the wealthy hilltop suburb of Clifton to the Hotwells spa and river transport links running beside the river Avon below. This was an impressive feat of engineering, and had required a couple of years of blasting and excavation through the heavily faulted limestone cliffs of the Avon Gorge. The tunnel was then lined with very thick brick walls and given a vaulted brick roof to catch any falls from the rock roof. Four tramcar tracks were built which then operated more or less daily for the next four decades.

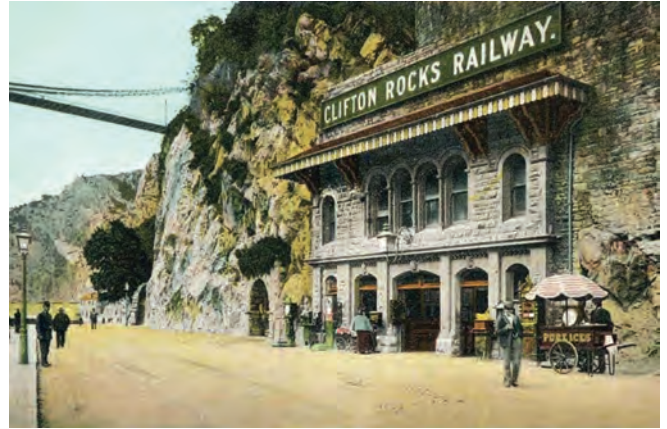


Each car consisted of an upper passenger section, with a triangular chassis angled to suit the gradient of the tunnel. Each car could accommodate 18 seated passengers and had sliding doors at either end

We began in the low-level station entrance hall, which contains the clack valve used to help retain the head of water in a pumped system. Above our heads would have been the original pumps that were the operating mechanism for the Rocks Railway. Water was stored beneath our feet in a reservoir, and would then be pumped up to the top of the tunnel where it would be piped into



Top of the Rocks Railway with two full pairs of tracks in the centre (one has a model railway car at its base), and single rails only of the two outer tracks (the other rails would have run where the stairs were installed behind the wartime blast walls)



An Edwardian postcard showing the lower station. This entrance survives but in 1956 cracks were noticed between the masonry of the lower station facade and the face of the limestone cliffs. Tubular steel scaffolding was used to shore up the facade and this remains in place today



Section near the top of the railway that was not used in the war due to its proximity to the surface, looking through a post-war viewing opening through the stair side blast wall



The original Rocks Railway low station waiting room, with timber panelling concealing steelwork with reinforced concrete infill



Original entrance turnstile at the top of the Rocks railway, now used as part of their museum

the uphill car, which would then descend under gravity, pulling up the lower car at the same time.

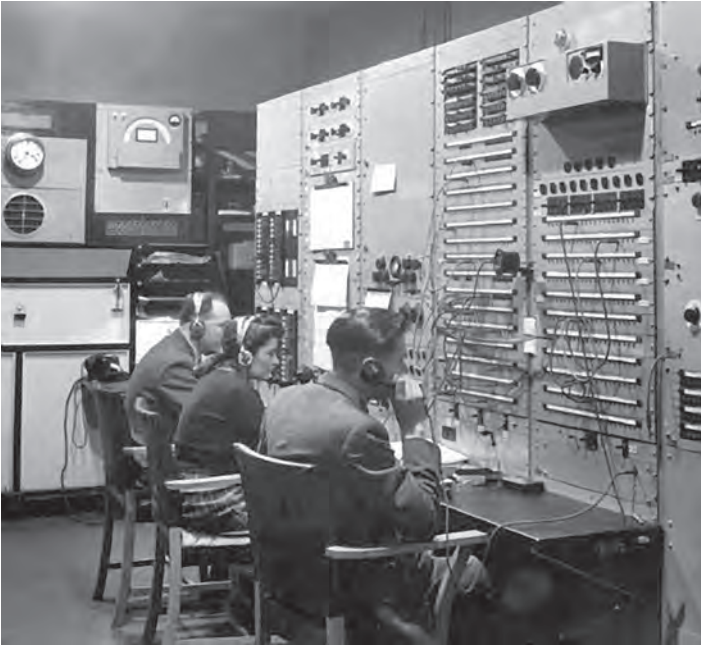
As all of the work was being done in bringing the cars up to the high-level station, passengers were charged one penny to go up and only a ha'penny to go down the cliff. Apparently, these clack valves are rarely seen because they are usually abandoned at the base of mines. To carry out the pumping, there would also have been two Crossley town gas engines and pumping equipment

in the chamber above our heads. As this floor carried the pumping equipment and had to contend with a high loading and a great deal of vibration, the floor incorporated reinforced concrete between steel beams, a novel feature at the time that the structure was being built at the end of the nineteenth century.

Auntie goes underground

This section would later be adapted for use by the BBC during World War II. The tunnel had been out of use since the railway had closed in 1934 but the war offered the prospect of renewed use. Imperial Airways, shortly to become BOAC (British Overseas Airways Corporation), was first to see the possibilities the tunnel afforded as a bombproof shelter and took over the upper section of the abandoned railway for use as a combined barrage balloon repair workshop and a staff air-raid shelter since it was next door to their requisitioned headquarters in the Clifton Spa Hotel.

The BBC's connection with the site came about by chance as it had really wanted the hotel as its wartime headquarters but had been beaten to it by Imperial Airways. As a peace offering, the airline board invited a couple of BBC executives to dinner in their new premises,



The BBC control room during WWII. This room handled all the home and overseas programmes of the BBC during the war



Sections used as offices and for barrage balloon repair



Avon Gorge Hotel (originally Grand Spa Hotel) with its Pump Room on the left side. The Rocks railway top station is to the rear of the camera

and during an air-raid alert took them down into their shelter in the high-level station.

The BBC managers immediately realised the site's potential and started a lengthy process of trying to find out who they needed to approach about the purchase of the low-level station.

Getting together representatives of all the bodies that might have ownership rights took some doing, and a meeting was held inside the tunnel. The latter turned out to be a masterly stroke as the Regional Commissioner, who was also in attendance, objected to having drips from the ceiling fall on his head and brought the meeting to a speedy conclusion. The BBC was allowed to buy the low-level station, and began the process of converting it into five floors of accommodation that would come to be known as their Tunnel Fortress.



At the top of the south side wartime access stairs, where the reinforced concrete ceiling shows how close to the surface, and thus more vulnerable, it is

This included, from the fifth floor down, a transmitter room, a studio for up to fifteen people complete with piano and gramophone, a recording room, a permanently manned control room linked by eighty land lines to radio stations around the country, and finally a lower, ground-floor level with emergency generators, gas-protected ventilation plant, and a canteen.

There is more room on this lowest level as the tunnel was built with a 60ft or so horizontal section before inclining upwards. A stairway was left at one side of the BBC offices to allow for access between floors and also escape in either direction in the case one or other of the tunnel entrances got blocked during bombing. Ladders were also provided between floors to give further escape possibilities.



BBC Transmitter Room, the topmost level of the BBC section
Many traces of the wartime ventilation system remain, including fallen ductwork, old hangers on the walls and a high-level hole in the wall where it had passed through



SubBrit member Mike Stace looking into the BBC Transmitter Room

into the plant room. Our guide said they would love to hear from a services engineer who could tell them more about how the system had operated.



Plant room in the wartime BBC section of Clifton Rocks railway, showing applied corrugated sheeting to keep masonry falls from damaging machinery, and also some fallen ventilation ductwork. The wall at the right hand side is the external wall visible from Portway Road



BBC plant room looking towards the external wall

A Night on the Terraces

The remaining middle section of the tunnel would subsequently become a public air-raid shelter with assistance from Queen Mary. Two sets of concrete stairs were built on either side of the tunnel, separated by low-level brick blast walls from three central shelter compartments running down the slope. These

compartments were separated from one another by cross-slope blast walls between which toilets were placed.

The old funicular railway track was then covered over with pre-cast concrete planks to form terraced steps on which shelterers would have sat like an audience in a small and very uncomfortable theatre.

To make the surface more homely and a bit drier to sit on, the terraces were covered with linoleum, scraps of which still survive. Another measure to improve conditions and keep shelterers dry involved a canvas anti-drip sheet being draped above the central shelter sections, draining to triangular wooden gutters fixed against the side of the blast wall.



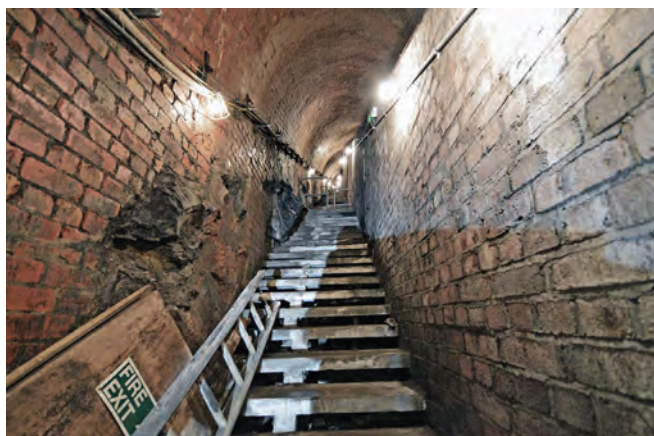
Lowermost shelter section 3 showing the precast concrete floor planks installed during the war when the centre level became an ARP shelter. Wartime blast walls form the sides with the access stairs on both sides behind them. The slenderest volunteers have been able to squeeze between the floor planks to search for relics dropped by the shelterers on the floor on which the original railway tracks were laid



North side stairs with upper level access to shelter section 3 visible

The railway covered the 240ft (72m) vertical distance between the stations at a gradient of about 25 degrees but the stairs alongside the two perimeter walls feel steeper than that, and it must have seemed bizarre to the uninitiated wartime user.

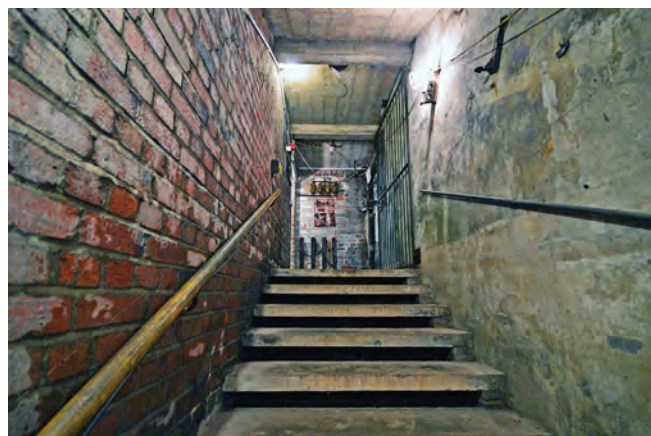
Along the side walls the bare rock surface protrudes in many places, while higher up the walls there are old hangers used to carry the radio cables from the BBC



Going up the north side precast concrete plank stairs built during the war. The bedrock surface protrudes through the wall adjacent

studios up to aerials on the surface. Near the top of the stairs the ceiling above the steps was bolstered with reinforced concrete as it was that much closer to the surface.

The tunnel had been built starting at both ends, and Mike, our guide, showed us an irregularity in the vaulted ceiling halfway up, in the public air-raid shelter



Last few steps of the south side stair leading up to the original Rocks Railway Waiting Room used as a First Aid Post in the Second World War

section, where he thought the two parts had met. This was a very small discrepancy and again speaks highly of the accuracy of the builders at the time.

Many thanks to our guides and staff from the Clifton Suspension Bridge Trust, and also to Maggie Shapland, Mike Taylor and helpers from the Clifton Rocks Railway Trust. All colour photos Chris Rayner

An enigmatic tunnel at Addington, London Borough of Croydon

Addington, a former rural village around three miles south-east of the centre of Croydon, was absorbed into the County Borough of Croydon in the 1920s, and the London Borough in 1965. It is known now primarily for its large council estate, New Addington, where one branch of Croydon's modern tram system terminates. At and near the old village centre lies the ancient parish church, and Addington Palace, a sometime residence of Archbishops of Canterbury from 1807 to 1896. Both New Addington and Addington Village are on the Chalk outcrop, but between the latter place and Croydon the ground rises steeply over Thanet Sand, Woolwich & Reading Beds, and Blackheath Pebble Beds at the top of Addington Hills. 'Secret tunnels' were noted here in 1799.

The report is to the effect that ...

The church of Addington, in Surrey, as well as the village, is most delightfully and romantically situated in a deep valley, surrounded by hills of the liveliest verdure and most inviting appearance. The church ... is one of the oldest in the country, and, it is believed, in England, considering that it is not a cathedral, and bears certain evidence of being built before the time of Edward IV [Reigned 1461 - 1483]. On an eminence adjoining there are the remains of a monastery, between which and a retired spot at the distance of a mile a subterraneous

passage communicates, which even now is penetrable for a considerable distance.

In a later volume of the *Gentleman's Magazine* we find however:

As there never was a monastery in this parish, what are called remains of one are most probably those of the Manor-house, which Sir Robert Aguilon has license from Henry III to embattle and fortify on a spot near the church, still called the Castle Hill, the subterraneous passage between which and a retired spot at a mile distance may have been a drain, or arched vault, belonging to the mansion.

Castle Hill is a name still in use locally, but the probability is that both 'castle' and 'monastery' were in fact no more than a previous manor house. The tunnel, probably a capacious drain, seems still to have been accessible at some time in the first half of the 20th century, as a drawing of its interior is preserved in the W.H. Mills Archive at the Museum of Croydon.

SOURCE: GOMME, George Laurence (edr), 1900, *English topography. Gentleman's Magazine Library. Being a classified collection of the Gentleman's Magazine from 1731 - 1868. Part XII. Topographical history of Surrey and Sussex*. London: Elliot Stock: Gentleman's Magazine Library XII: xiv + 381pp [The tunnels are noted on pages 50 and 944]



London Borough of Brent Emergency Centre

Keith Ward & Nick Catford



The emergency exit tunnel from the basement of Brent town hall

In 1934, Wembley Council decided to centralise their offices after Kingsbury Urban District was re-amalgamated with Wembley Urban District. They bought a 5¼-acre site for a new Town Hall at ‘The Paddocks’, Forty Lane; this was in Kingsbury, but conveniently near Wembley Park station. The building was designed by architect Clifford Strange.

Strange was influenced by Dutch architect Willem Marinus Dudok who had built the Hilversum Town Hall in the Netherlands. Dudok was a modern architect but used brick, a traditional material, rather than reinforced concrete. Strange followed his example using brick cladding around a steel frame.

Work on the Town Hall started in October 1937. The building was to have an asymmetrical plan with an off-centre main entrance. It is effectively an asymmetric ‘T’ with the bar, the 350-ft main frontage of the building facing Forty Lane, longer than the stem.

Civil Defence and WWII

During the build-up to WWII, Middlesex County Council had been doing a lot of forward planning towards civil defence and part-funded any civil defence works within its boroughs. The new Town Hall at Wembley was completed in 1940 and the basement was reinforced to

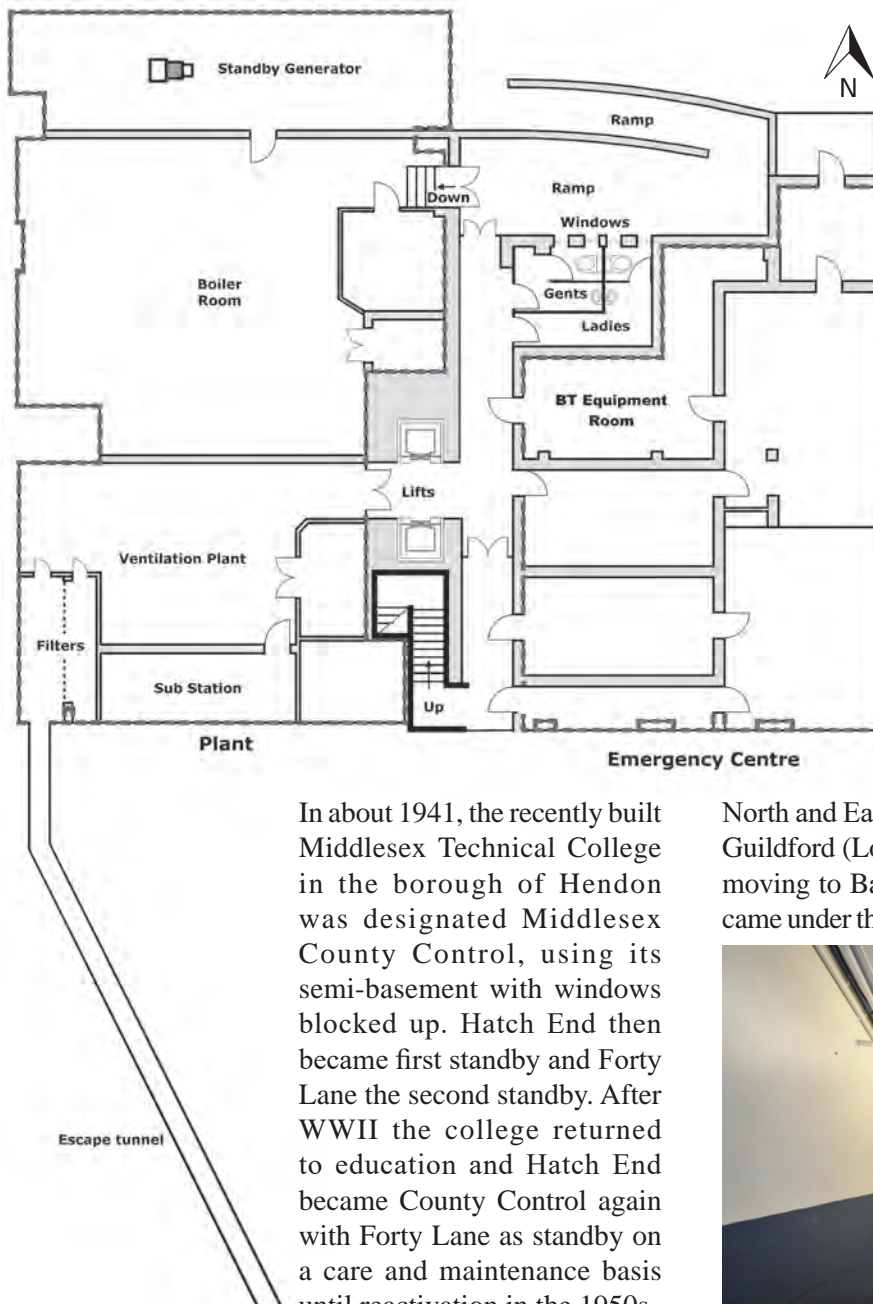
act as an ARP (Air Raid Precautions) reporting centre for the Borough. The Centre would receive information from wardens and messengers and manage the delivery of the relevant services needed to deal with each incident.



Brent Town Hall

At the same time, a Middlesex County Control was built at Hatch End with a Standby County Control in the basement of 45 Forty Lane, Wembley, very close to the Town Hall. This was a purpose-built Civil Defence Control Centre comprising a basement control and single-storey training centre above. (The building was demolished in the 1980s and the site is now a garage.)





In about 1941, the recently built Middlesex Technical College in the borough of Hendon was designated Middlesex County Control, using its semi-basement with windows blocked up. Hatch End then became first standby and Forty Lane the second standby. After WWII the college returned to education and Hatch End became County Control again with Forty Lane as standby on a care and maintenance basis until reactivation in the 1950s.

Cold War Reactivation

After WWII, the basement of the Town Hall remained unused until 1952 when Middlesex County Council, who remained enthusiastic about civil defence, planned a series of new control centres at most borough council headquarters. These could be either underground, semi-sunken or surface controls and would be built to a standard layout.

However curbs on spending by the Home Office stopped this programme after just a few were built. The Tottenham Borough Control, which was built as part of this scheme, survived at the rear of the Town Hall until the site was redeveloped in 2004. (See www.subbrit.org.uk/rsg/sites/t/tottenham_control/index.html)

At Wembley, the new Borough Control would have been alongside the WWII County Control at Hatch End. With the cancellation of the new-build scheme, the WWII County facility was brought back into use. The WWII

standby site at Forty Lane was by now flooded and unusable although the upstairs training centre remained in use until 1968. So instead, Wembley Town Hall was designated Reserve County Control.

In 1961 a reorganisation of Civil Defence areas saw Wembley designated as an Area Control with Willesden and Ealing as subordinate Controls, and Wembley reporting to County Control at Hatch End. By this time a County Standby site was not deemed necessary. Hatch End reported to the Home Office London North Group Regional War Room at Partingdale Lane, Mill Hill.

In 1964 the London Regional War Rooms were abolished as was London Civil Defence Region 5. From this date responsibility for the London Borough Controls was split between the RSGs/SRCs (Regional Seats of Government/Sub Regional Controls) at Cambridge (London

North and East), Fort Bridgewoods (London South East), Guildford (London South West), and Warren Row – later moving to Basingstoke (London North West). Wembley came under the jurisdiction of the Region 6 at Warren Row.



One access to the Emergency Centre spine corridor is down a ramp at the rear of the building. Blast doors were never fitted with just an ordinary door offering little protection

In 1965 Middlesex County was abolished and the Wembley and Willesden Urban District Councils were combined within the new Greater London Council (GLC) area becoming the London Borough of Brent. At this time Brent's Control was located at Willesden Town Hall although that didn't have a basement; there is no explanation for this strange decision in council minutes. Being both modern and large, Wembley Town Hall became the new Brent Town Hall and the Victorian Willesden Town Hall was eventually demolished.

Civil Defence Stand Down

With the stand down of Civil Defence in 1968, all Controls were put into care and maintenance, but in the 1971 Civil Defence Review, Wembley Town Hall was once again



designated as Borough Control. London Civil Defence Region 5 was also reinstated so Wembley then came under Region 5 under the jurisdiction of Kelvedon Hatch which became Sub-Regional Headquarters 51 in 1973.

In 1977 the GLC created four Regional Group Controls with groups of Boroughs reporting to them – they used the old war room sites except for the South East Group Control that used the old Lambeth Borough Control at Peartree House. Wembley now reported directly to London NW Group Control at Partingdale Lane, Mill Hill.



The town hall lifts (seen left and right) go down to the basement. The emergency centre is behind the photographer. The plant rooms for the Town Hall are through the wooden doors

In 1981 some upgrades of the London Borough Controls were required by the Home Office; however both the GLC and Brent Council were politically well to the left and they did everything possible to disrupt Home Office plans.

Brent Emergency Centre is born

In 1983 the GLC was required by the Home Office to set up a Group Emergency Centre for each of its five groups of boroughs. District Councils and London Boroughs had to provide one centre each. An emergency centre was to be a 'reasonably protected premises for emergency use with adequate communications' from which to 'control and co-ordinate action' in the event of hostile attack or a threat of hostile attack.

The centres were not expected to be proof against direct nuclear attack but should be capable of continuing operations 'despite the effects of more distant attack'. The emergency centre was to be capable of accommodating and supporting the staff necessary to provide the control and co-ordination.

Each Centre should be capable of withstanding a static overpressure of 1.5 psi, provide a protective factor of 100 and be able to operate independently of mains services for 14 days. Brent's designation was 51E2. Suitable provision was to be made for domestic accommodation and equipment; particular guidance was given on ventilation and air filtration. Apart from the installation of an upgraded ECN (Emergency Communications Network) in 1986 little else was done to upgrade the Wembley Town Hall basement.

When the GLC was abolished in 1986 the London Fire



All the rooms in the Emergency Centre are now stripped of all fixtures and fittings although ventilation trunking can still be seen in all the rooms

and Civil Defence Authority (LFCDA) took over Civil Defence from 1 April. Being a non-political organisation, upgrades to Emergency Centres began about 1990 but Brent doesn't seem to have received an upgrade by the time the LFCDA finished with Civil Defence in 1991. On 24 September 1990 Brent Town Hall was Grade II listed by English Heritage.

Final Days

Due to neglect from the GLC days, the whole of the West London communications network was virtually non-existent with communications being patched in wherever they could. The old GLC Group Control for North West London in Beatrice Road, Southall, was inoperable and Brent was patched into Wanstead (North East London Group Control) as an interim measure. The LFCDA did start to upgrade the Emergency Communications Network but the end of the Cold War put an stop to this. During the 1980s, Emergency Planning generally used upstairs rooms in the Town Hall, but the basement was still used in any exercises. By 1991 the basement was officially out of use although the ECN equipment in the basement was last serviced by BT in 1999.



Standby generator

In 2009 Brent Council wanted to delist the Town Hall to facilitate redevelopment of the site. On 5 February 2013, the council sold the building, and services including

emergency planning were relocated to the new Brent Civic Centre which opened in August of that year. The French Education Property Trust purchased the site on 1 February 2012 for transformation into an international French school called *Lycée International de Londres Winston Churchill*.

Visit to the Town Hall basement

Once the Town Hall had been handed over to the contractor for development we were able to arrange a visit to the basement. This took place on 27 February 2014 – a week before work on the redevelopment of the site started.

From the ground floor of the Town Hall we descended stairs down to the basement where we entered the main spine corridor. This corridor could be also accessed by two lifts and from an external ramp at the rear of the building. From the spine corridor the Emergency Centre occupied a series of rooms on the east side while those on the west side were occupied by the Town Hall plant rooms.

It was immediately apparent that the basement had never been upgraded which, if Wembley had complied with Home Office requirements in 1983, would have included installation of blast doors, pressure valves, decontamination suite etc. and the complete upgrading of the air-conditioning system.



The BT equipment room



Wall-mounted Line Terminating Unit in the BT equipment room

All the rooms in the Emergency Centre were accessed through ordinary wooden doors. The rooms had been stripped of nearly all fixtures and fittings and there was no

indication what any of them had been used for. There was metal ventilation trunking either suspended from the ceiling or fixed to the wall running through each of the rooms.

Phoney War

The BT equipment room still had a wall-mounted Line Terminating Unit (LTU) for the Emergency Communications Network although the TSX50 ECN exchange it would have connected to together with terminal equipment and other apparatus had gone. The TSX50 had a capacity for up to 80 extensions, 24 exchange lines, and eight private circuits and had its own control console.

The LTU is where all the incoming cables were terminated on what are called Krone strips. Onward wiring went to individual bits of equipment inside the Emergency Centre or elsewhere at the Town Hall as cables were fed into a smaller distribution box on the wall above. A printed sheet inside the cabinet was dated 09.02.1999 which is probably the last time a BT engineer was on site.



The gents' toilet comprises one WC cubicle and a sink; windows are seen on the left

The ladies' and gents' toilets were located at the north end of the Emergency Centre, accessed from the spine corridor. They each comprised a single WC cubicle, with two windows onto the rear access ramp, and a washbasin. This seems totally inadequate for the number of people who would have occupied the Emergency Centre.

Unusual Emergency Exit

The west side of the spine corridor consisted of a series of plant rooms for the whole building. These included air-conditioning plant, boilers, a sub-station and a standby generator for use in the event of a failure in the mains supply. On the west side of the plant room there was a narrow room that appears to have contained filters at some time, probably during WWII.

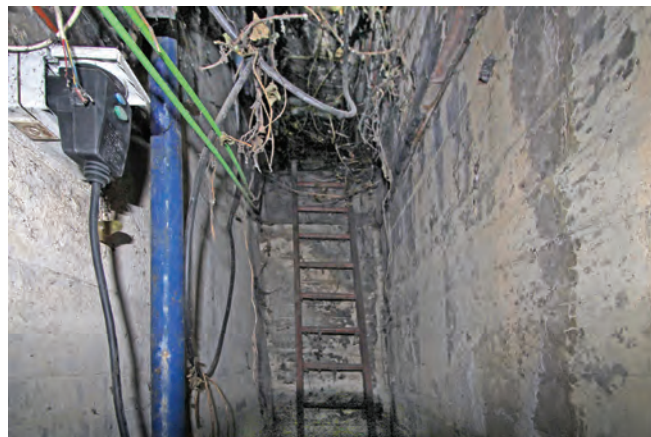
At the far end of this room there was a long concrete-lined tunnel that ran for about 100 feet turning to the east below the south face of the building. It terminated at a ladder which is about ten feet in height. At the top of the ladder, the tunnel continued for some distance, its roof comprising a line of removable concrete panels located between the south face of the building and the



The filter room with the emergency escape tunnel on the far side

Town Hall front car park on Forty Lane. Daylight could be seen along the length of the tunnel and it seems clear that these panels were designed to be removed to allow people to escape from the building along the tunnel.

Having visited the site, it appears to have been too small for both Borough Control and County Standby, however it is likely County would have used part of the upstairs building as well. After our visit, work on refurbishment of the building started almost immediately and the new school opened in September 2015.



A ladder at the end of the emergency escape tunnel leads to a line of removable concrete panels in front of the town hall

SOURCES

Struggle for Survival – Governing Britain after the Bomb (Steve Fox, 2004)

A Brief Architectural History of Wembley (later Brent) Town Hall (M.C. Barrès-Baker, Brent Archives)

Various files at the National Archives

London Borough of Brent Civil Defence Records.

Photos Nick Catford

GIBRALTAR STUDY TOUR, 16-20 OCTOBER 2017

There are 6 places still available on the 16-20 October trip. Gibraltar is an amazing destination, and this is a rare chance to visit such a range of iconic underground sites. It has taken 8 months to organise so if you miss this one you may have to wait a long time for another opportunity! We shall be seeing:

- The Northern Defences - an extensive network of C18 tunnels and defensive lines.
- The Great Siege Tunnels - the original gun galleries cut into the face of The Rock.
- Willis's Magazine - the largest C19 magazine of its type.
- Parson's Lodge Battery - a Europa Nostra 'historic fortress' - active for 2 centuries.
- The '100 Ton' Gun - Armstrong's biggest muzzle loading gun: one of only 2 surviving.
- Devil's Gap Battery - two emplaced 6" guns, extensive magazines & shelter.
- Lord Airey's & O'Hara's Batteries - two 9.2" guns, magazines, shelters & engine room.
- Admiralty Tunnel & Eisenhower's HQ / NATO COMCEN - the nerve centre of The Rock.
- The Underground Water Reservoirs (with a tunnel right through The Rock).
- Hay's Level - an extensive complex of WWII and earlier military tunnels.
- Great North Road - the famous N-S military lorry tunnel & key locations along its route.
- The Stay-Behind Cave - the covert observation hide of the legendary 'Operation Tracer'.
- Fire Control South - the Fortress Command post for all the big guns of the south.
- Calpe WWII Underground Hospital - prior C19 gun casemate & WWII air-raid shelter.
- Princess Ann's Battery (three extant 5.25" guns) - plus adjacent batteries & shelters.
- Calpe Hole Underground Generating Station - massive engine plant still in place.
- Lower St.Michael's Cave - extraordinary cave formations & underground lake.

The tour cost is likely to be around £100. Book your own flights & accommodation. Gibraltar is a Sterling currency area (of course!) with costs broadly comparable to UK.

I'm happy to answer any questions, email me at: timothy.wellburn@gmail.com



Mail Rail - Sub Brit plays its part

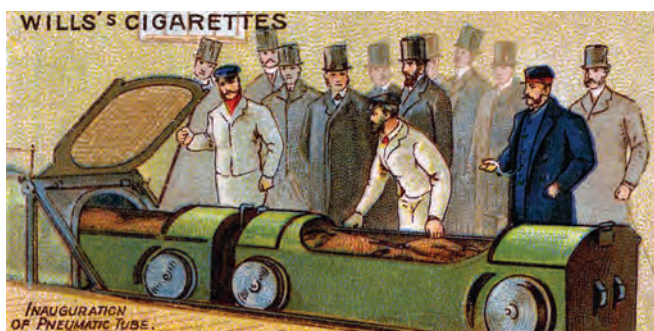
Linda Dixon



Junction at the bottom of the maintenance incline where the lines lead to the eastbound (left) and westbound platforms at Mount Pleasant

As Old as the Hills

Plans to carry mail underground London are as old as the hills – or at least as Sir Rowland Hill, the great postal reformer, who commissioned a feasibility study into a pneumatic tube in 1855-56. Although deemed feasible, the plans were not progressed for cost reasons. A pneumatic scheme was constructed however, opening in 1863 between Euston Station and Eversholt Street after a trial scheme in Battersea. Further extensions were constructed but it was concluded that the system offered insufficient benefit and was closed in 1874.



Almost 40 years later, a scheme was developed to build a larger railway using electric motive power between Paddington and Whitechapel. With eight stations, the tunnels were largely constructed using Greathead shields by Mowlem. The work was suspended during World War I and the network finally opened in 1927. The track gauge is a mere two feet wide and the line was christened 'The Post Office Railway'.

Most of the network is a double track tunnel but these split before stations into two smaller bore tunnels. The stations themselves are in much larger 25 feet diameter tunnels. The lines ascend towards stations to aid braking and descend on leaving stations. This also means that the stations, all beneath sorting offices or mainline stations, are shallower with less distance for staff and mail to be transported.

Last Post

The network saw many years of use, with new trains in 1930 and a new Western District Station opened in 1965. My first memory of its existence was seeing Blue



Peter's John Noakes ride amongst the mail bags some time in the 1960s. In 1987, in celebration of the line's 70th anniversary, it was renamed 'Mail Rail' and new rolling stock commissioned.

Sadly all good things must come to an end and in 2003 the Post Office announced the closure of Mail Rail. After lying disused for many years, the Postal Museum (as it is now) saw the potential for the site and made a planning application in 2013 to Islington Council to reopen part of the line as a tourist attraction. Sub Brit made several comments on the application, largely to ensure that there was the minimum destruction of features and that the attraction catered for engineering and subterranean enthusiasts as well as schoolchildren and stamp collectors.

The new Mail Rail

Disproving the old adage that philately will get you nowhere, the application was approved and work commenced with conversion, fund raising and publicity. Part of the fundraising was to individuals to 'sponsor a sleeper' and Martin and I did our bit and made a donation. More significantly, Subterranea Britannica also agreed to support the project, opening up as it does a fascinating underground space to the public.



The new passenger trains at their terminus in the old maintenance depot. The green one is just coming up the incline from the main tracks

As individual sponsors of a sleeper, we were invited to 'Walk the Rails'. This event was before the main public opening and included a trip on a new train and a chance to actually walk through the tunnels on the new route. In recognition of Sub Brit's support for the project, there will be similar opportunities for all Sub Brit members over the coming years. We expect these to be popular so will probably draw places by ballot and make a small charge. On the evening of our visit, about 20 of us congregated in the old maintenance depot below Mount Pleasant. There is a smallish but well curated exhibition about Mail Rail and its history with some nice old artefacts. The

exhibition space has been sensitively built over the old working area so that the floors, rails and working pits can be seen through grills and spaces in the floor.

Passenger trains

The new trains are (by necessity, due to the size of the tunnels) tiny and could apparently hold 32 passengers – although this would be a very tight squeeze! There were a dozen or so in our group and we fitted snugly. The Perspex covers were lowered and we were off! Down a steepish incline to the main tracks and a 180° curve to line up with one of the original Mount Pleasant loading/unloading platforms where we paused. There is a mini slide-show here, before another tight turning loop. Here we passed over some old tracks – still used to store old trains; these are nicely lit for viewing. Back through the second platform (another slide show) and the final bend before we were back at the 'terminus'. Although it took 20 minutes, it seemed over too quickly!



The author and one of the last mail trains, stabled at the Mount Pleasant platform

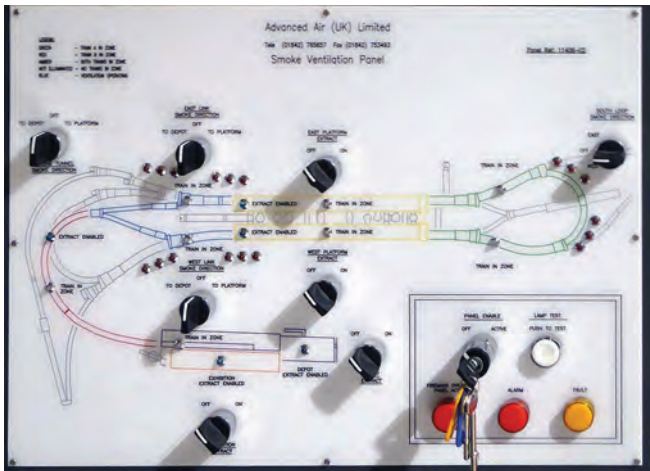
We had a chance to look round the exhibition area before the long-awaited walk through the tunnels. The exhibition includes one of the 'original' pneumatic carriages – rediscovered in 1937! There were some hands-on exhibits – perhaps a bit too tame for most of us – but there was a popular mock-up of a Travelling Post Office, complete with shaking floor and pigeon holes to allow you to try sorting letters and parcels on the move.

Walking the tunnels

Then the real highlight of our experience – a chance to walk through the tunnels. It should be remembered that we only get to see the tunnels below Mount Pleasant which contain the two platforms which would have been used to load and unload mail sacks and the connecting tunnels to the maintenance depot. The main length of the tunnels is still owned (and maintained) by Royal Mail and is blocked off to visitors.

We followed the route taken on the train ride. Kitted up in hi-viz vests and shiny new red hard hats, we went down the incline and as we stepped over the rail sleepers we could see the donation plaques; number 56 was the first one we paused at, belonging to one of the people in our group – so a nice stop for photos (but actually for the rest of us to have a good look round!). Photography was allowed throughout which was good.

We continued in this fashion, ambling along and stopping occasionally and then got to the first of the platforms. Here there was one of the old trains stabled and on the platform, still in situ, was the chute which received the mail bags and fed them onto the conveyor belt. Along the edge of the platform were three rubber-edged sections which is where each train would have stopped and the flaps lowered to allow loading/unloading of the trolleys ('Yorkies') carrying the mailbags.

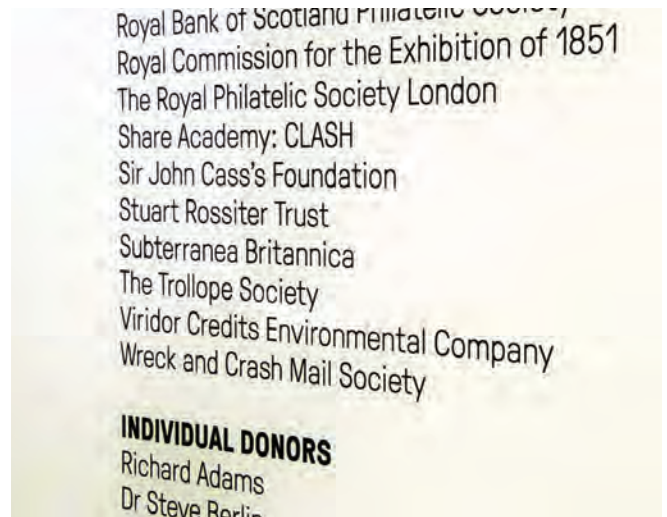


Smoke ventilation panel, showing the route taken by the passenger train. The display shows which trains are in section and controls the smoke extract fans and direction

Finding our plaque

Our own plaque was number 150, duly located and admired. There are 313 plaques so far, with plenty of room to take further donations to help support the museum. Subterranea Britannica is also listed on the sponsorship board for all to see and we have agreement to recognise Chris Rayner's contribution to Sub Brit and our underground heritage by a dedicated plaque.

Our walk concluded as we went through the second platform, with similar original artefacts, and then back up the incline. A splendid evening and one which some of you will have a chance to see on one of the special Sub



The Sponsorship Panel at the entrance to the Mail Rail Museum, showing Sub Brit as a major donor to the project



Linda and Martin Dixon with their own sponsorship plaque
Brit tours that will be arranged. Public train rides can be booked through www.postalmuseum.org
A feature on the Post Office Railway was published in *Subterranea 2*, July 2003.
Photos by Martin & Linda Dixon



An old maintenance train, constructed to carry engineers, stabled at the platform

Portland Site Visits 14 June 2017

Thanks to member John Marquis, 24 Sub Brit members enjoyed a splendid day out visiting two very different sites on the Isle of Portland in Dorset. The visits are described below by two of our most knowledgeable members.

Portland Stone Firms Ltd

Roger J Morgan



The Sub Brit party poses for the camera in front of the entrance to the underground workings at Perryfield Quarry

It was a blazingly hot day when we assembled at 0930 at Fancy's Family Farm [50°33'32.02" N 2°25'53.88" W] on the Isle of Portland, Dorset. The plan was to split into two groups – one to go first to the Portland ROTOR bunker in the Verne ditch, and the other to Portland Stone Firms Ltd to see an underground and surface stone quarry and their processing factory. The groups would then switch for the afternoon – I was in the first party of twelve for the quarries.

A convoy of cars followed Geoff Smith of Portland Stone (one of two firms extracting stone from Portland) to Perryfield Quarry two miles south, opposite the Portland Museum at Weston. This is a conventional opencast quarry which they had recently decided to develop by tunnelling from the easternmost vertical face under the adjoining fields. Technically this is not a 'mine' but an underground quarry.

Portland Building Stone

The Portland freestone series is about 10m below ground level and consists of (working upwards) Basebed 2–3m; Curf (or Flinty) 1m; Whitbed 2–3m and Roach 2–3m.



Looking west across the Perryfield quarry floor. The left-hand portal is the working adit, the right-hand a blind portal to be used in the future as an exit

Above this is a Purbeck stone Cap 3–4m which forms the roof of the quarry. All the beds dip to the south.

Fortunately, the degree of cementation in Portland Stone is sufficient to allow it to resist the detrimental effects of the weather, but it is not so well cemented that it can't



be readily worked (cut and carved) by masons. This is one of the reasons why Portland Stone is so favoured as a monumental and architectural stone. Only the Basebed, Whitbed and Roach bed are used for building, the principal difference being in the proportion of fossilised shell in the stone.



General view of pillar and stall working

Geoff first took us into the site hut to explain the plan – the method of working is standard ‘pillar and stall’, a rectangular chessboard of 7m-wide alleys and 4 x 4m square pillars supporting the roof. At the moment there is only one entrance to the underground quarry, with the portal of another to the right ready to be opened when the workings are more extensive and there is need for an in-out system for air and transport.

He described how they have to stabilise the ceiling with a regular grid of 2.5m rockbolts, for which they have automatic machines which can drill, place and tighten the bolts in two minutes. To every tenth bolt or so they attach a tell-tale with a dial which will indicate if the roof has moved, and every so often they have to hang weights on the bolts to confirm the ceiling is still sound.

All the Portland stone beds are criss-crossed by cracks or faults in a rectangular array N–S and E–W (caused when the beds were pushed upwards) and the skill of the quarrymen is to position the cracks in the pillars, rather than the open roof.

Going underground

We then entered the portal and went south to see a cutting machine. This is a caterpillar-tracked chainsaw, but scaled up by about five, and costing £0.3 million. It is controlled by one man and a computer, and cuts the stone just as a chainsaw would cut timber, but slowly and silently at 8–11 cm/minute. The blade could be thrust forward, angled left-right, and traversed sideways about 3m, and the whole system rotated from horizontal to vertical cutting.

The technique is to cut slots 2.2m deep up both sides and across the top and bottom of the face, leaving the block held in place only by the (inaccessible) back face. Then aluminium flattened balloons (‘pad’) are inserted into the slots and expanded with high-pressure water, which gently breaks out the block.



Cutting machine is seen in the cross alley

We passed another cutting machine (the whole site was very busy with lots of machines working) and then progressed five or six pillars eastwards into the unlit alley to a southward working face in a stall. A huge four-wheeled machine was breaking up the left-hand half of the face, the good stone to the right having been extracted. It was basically a JCB, but again scaled up by about five, with interchangeable front ends for breaking out or scooping up rubble.



Automated cutting machine sawing a horizontal slot in the face – the bottom slot has already been cut. The operator’s position is on the left with the computer screen



The cutting machine head carrying the chain saw can be traversed up/down; left/right and turned over

This was a very dramatic sight and we had to stand aside as the vehicle left the quarry to change heads and came back with the bucket on to scoop up a huge load. We were all gratified to be wearing hi-vis jackets to ensure we were visible to the workers.





Tractor breaking out rubbish stone from face with forks

It was great to see a quarry in action – so often our visits are in darkness to abandoned or derelict underground spaces. Although the layout would be familiar to earlier quarrymen, the technology in use was especially impressive. As we left, our attention was drawn to a typical block of 4.2 cubic metres, worth about £2,500.

Back into the sunshine

We then returned to the cars and went in convoy again to Broadcroft quarry, one mile north at Grove. This is a conventional opencast quarry and was blindingly bright white in the brilliant sunshine. We lined up on the western rim and looked down into it at a working face opposite. In contrast to what we had just seen, the stone here is won with explosives in drilled holes.



Broadcroft Opencast Quarry looking southeast. A drilling machine placing holes for blasting – the front loader appears to be carrying a steel box, perhaps containing the black powder charges. A mobile saw in the background with cut blocks drying. Harder overburden over desirable stone can be seen in quarry face

First the Cap (which is as hard as granite) is broken up with high-explosive dynamite, and then a long line of holes is drilled below the Basebed and tamped with black powder, which when fired explodes with a much slower and less powerful effect, just lifting the stone slightly and ‘popping’ it out. The stone thus popped is then moved to a laying-out area of the quarry bottom and trimmed by caterpillar-mounted chainsaws.

The explosives were housed in a mobile magazine which provided a safe forward store. The advantage of open-

cast quarrying is that a greater volume of freestone can be extracted four times faster, but the disadvantage is dealing with all the overburden waste and some wastage of the freestone due to the explosions. Underground quarrying gives only with what is required, and it comes out in semi-rectangular blocks; it is, of course, more environmentally friendly and allows exploitation beneath already developed surface areas; but is slower.

Stones into Building Blocks

The convoy then moved to the processing plant, half a mile west at Easton. This is a long, narrow site with four primary processing sheds at the north end and three finishing sheds, plus administration buildings, at the south end. The blocks of stone were progressively reduced to yield the pre-ordered dimensions – there is no speculative cutting of standard blocks.

Every block is a one-off pre-specified by the client and is accompanied throughout processing by a coloured ticket specifying its parameters; the skill of the masons is in placing the cuts to minimise wastage (much like cutting diamonds in Hatton Garden!). All the cutting and sawing machines utilised continuous sprays of water, but the resulting slurry is collected and the water is separated out and reused; it is a very ‘green’ operation.



Front view of an initial cut Benetti horizontal chainsaw reducing blocks to manageable size; water is cascading off the cutter and stone dust jetting from the blade



Side view of the Benetti chainsaw

Initial cuts on the rough blocks are made vertically downward on three ‘Fast 736’ Benetti Italian primary cutters operating rather like a water-lubricated horizontal

band-saw but using diamond-encrusted wires from China, computer controlled and cutting at about 68mm/minute, though they could do double that.

In passing to the next shed we looked at a large lump of fossilised tree trunk (the primeval sea must have been quite shallow with driftwood). The second shed had four circular diamond-tipped saws, the third a totally automated production line to produce ashlar flats planed on all six sides; there is also a machine with automatically produced eight-stone balusters (for bottle balustrades) a day.

Shaping and Polishing

Moving to the other end of the site we entered the finishing plant, where the rectangular blocks are shaped if required. There was a tilt-turn table and three planers with a tungsten-tipped library of interchangeable tools which were scraped from one end to the other of the block to produce the required profile, an 'Omag' five-axis computer-controlled miller using a small circular saw and finally three more large circular saws.



The third shed with the Gisbert totally automated ashlar flats production line in the background and finished product in foreground



The output conveyor of the Gisbert production line

We then entered the domain of the masons: a much smaller workshop with smaller routers and cutters where hand-sculpted blocks are produced. There are even apprentice's work-pieces – a cube with A, B, C etc on each face, and a pair of stone dice. Next was the drawing office, where layout drawings are prepared of every facade, showing each individual numbered block,

from which the coloured job-tickets and attached zinc or plastic templates are prepared which accompany each block throughout its processing.

Lastly we passed to the customer-facing side of the operation where there were uniform square samples of every type of stone produced for selection, layout plans, and promotional photographs of completed jobs and computer visualisations of those in the pipeline.

It was fascinating to see the complete process from native rock to finished article and we were all impressed by the skill of the workers and the commitment of the firm to apprenticeships.

The convoy then returned to Fancy's Family Farm, arriving at about noon, ready to go down the ROTOR bunker in the afternoon. A good proportion of the party partook of the burgers, sausage sandwiches and drinks from the Farm canteen whilst enjoying the sunshine on their patio and indulging in SubBrit gossip, watched over by a barn owl!

Portland ROTOR Underground Bunker Bob Clary

After an excellent morning touring the new underground quarry at Portland Stone Firms courtesy of Geoff Smith we made our way back to Fancy's Farm for the descent into the Portland ROTOR bunker. Along with the adjoining citadel and high-angle battery, the whole site is a scheduled ancient monument as it is a particularly intact example of its type.

A detailed technical description of the site and its bunker is available on the Sub Brit website so here I've tried to describe our tour and the bunker as it appears today. I had been there on two previous trips some years ago before the advent of modern powerful LED torches and now much-improved digital cameras so I was keen to go back and see if I could take some better photos.

ROTOR Programme

The ROTOR radar programme was established in the early 1950s to detect and counter incoming Soviet nuclear bombers. The largest-ever MoD project at the time, the technology became redundant after only a few years. Partly this was due to improvements in radar technology, coupled with the decision to co-locate detection and interception functions. The biggest reason for the programme's end however was development of intercontinental ballistic nuclear missiles which even if detected couldn't be countered.

Portland ROTOR is a single-level R1 bunker and is unique in that it is actually a surface building despite the fact you have to descend a 20-metre vertical shaft and walk through a tunnel to get to it. This is because it was constructed in the bottom of the Verne Citadel's moat but is accessed from adjacent land outside the citadel so you get the impression that you're going underground whereas once out of the tunnel you are actually on the bed of the earlier moat.



It was intended that the Portland CEW station would be one of the first recipients of the advanced Type 80 radar, and the underground control bunker was modified during construction to incorporate a Kelvin-Hughes projector below the plotting room floor with a photographic display unit (PDU) in place of the manual plotting table. An American Type AN/FPS3 unit was installed, supposedly as an interim measure, until the Type 80 was available. The latter, in fact, was never installed and the Kelvin-Hughes well remained unoccupied.



The flat-roofed guard house at Portland was one of the few whose design was modified to incorporate local building materials

The guardhouse is also unique as it is not of the standard ROTOR design. It is curved and finished in Portland Stone so as to blend in with its surroundings. It has a veranda but, because it has a flat roof, it lacks the circular windows at the ends of an apex roof which are a familiar and distinctive feature of standard ROTOR guardhouses.

Ladder Descent

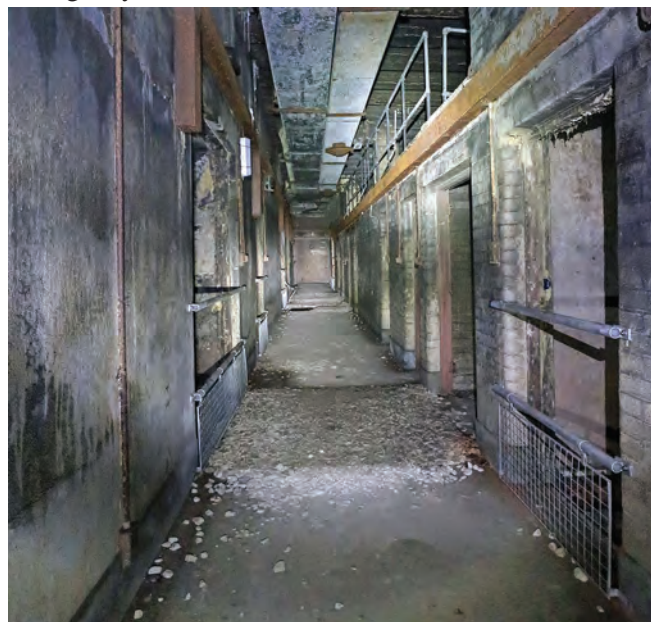
Portland was also the only ROTOR bunker to be fitted with a lift but sadly this has been removed together with the staircase and replaced with a two-stage vertical ladder. Thus our tour began by descending the ladder one by one. I teamed up with Martin, our esteemed chairman, and recent member Jago Wickers. We gathered at the bottom of the shaft which was dry other than a large puddle just by the ladder which I managed to step into.



The entrance tunnel

Looking down the entrance tunnel, we could see it is made of circular steel rings bolted together similar to a tube train tunnel. It is about fifty metres long and slopes gently down to the bunker. Turning right at the end of the tunnel, we entered familiar ROTOR bunker territory; we were now inside the R1 concrete box built in the moat.

A short corridor leads to firstly the transformer chamber on the left and then to the main blast doors, which are open. Interestingly, presumably because it's in the bottom of the moat, there is no cable shaft in the entrance corridor which is a standard feature of underground ROTOR bunkers. Here all the cables enter by either the main or emergency access shafts.



Looking along the main spine corridor with rooms entered on both sides. The underfloor cable runs have been filled with hardcore to form a solid floor

We walked slowly down to the far end of the bunker to get a feel for it and literally soak up the atmosphere. We were surprised how much plant remains. All the radar kit has gone but most of the electrical and ventilation plant is still there making this a very interesting bunker. Also much of the underfloor radar infrastructure wiring survives which is useful to see as at the Wartling bunker – which some of us are trying to preserve – it has mostly been destroyed.

There is much evidence of fire damage and everything is blackened and sooty. There is no lighting of course; the only illumination was our torches. I now remembered that it was the blackened walls that made photography so difficult and still does.

Emergency Exit

At the end of the corridor we left the operational part of the bunker and passed through the site of some blast doors into the combined emergency escape and air intake/extract area. Access to the escape is via a tunnel at right angles to the bunker some five metres up a shaft; a modern aluminium ladder is in position tempting one to climb up.



The high level emergency exit tunnel. The emergency exit is behind the photographer. Note the ladder at the far end which leads down to the bunker. The stairs here were removed by contractors before the bunker was sold

I climbed the ladder and entered the escape tunnel. It is about five metres long and full of cables running along its walls. This led to another shaft about twenty metres high, with no ladder, which would have led to the surface. This shaft is deeper than the entrance shaft because the land outside rises to the emergency escape.

We retraced our steps to the main part of the bunker past various plant rooms. The fans and switchgear in the outer area are still extant and the two electrical rooms on the left were complete, as is the main air-conditioning plant room on the right. It even had complete electrical circuit diagrams on the inside doors of the switch cabinets which were all labelled up with their function.

Further along on the left are the toilets and canteens. Three separate toilets, one each for men, women and officers, and male and female canteens separated by a small kitchen. Other than smoke damage these are all in surprisingly good condition. For example, all the sinks, urinals and basins are still in place and undamaged.



The small kitchen sandwiched between the RAF and WRAF rest rooms. There is a serving hatch into each of the rooms



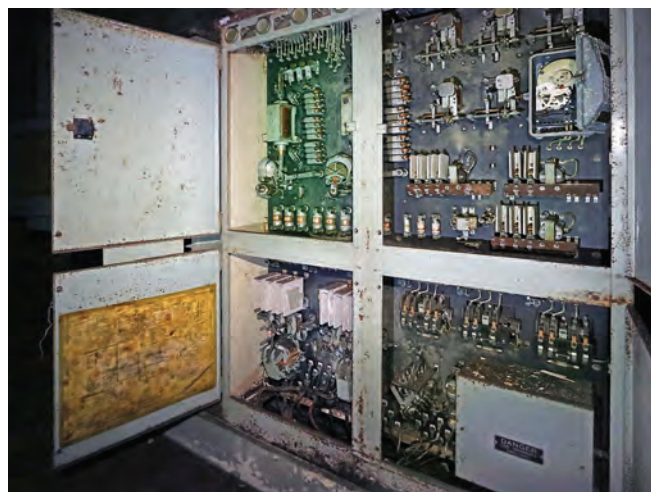
Martin Dixon waiting for his tea in the WRAF rest room – you'll have a long wait Martin!

Floorless Condition

The plant rooms and domestic facilities have solid floors so can be entered without fear of falling through a hole but the technical rooms and the corridor had underfloor voids for cable and ventilation trunking. Teak flooring was originally fitted but this has long since been removed.



The air conditioning plant room – one of the few rooms that always had a solid floor. It was entered by steps down from the spine corridor



Air conditioning switch cabinet with circuit diagram on door
While the corridor void has been filled with hardcore to form a floor, the floors in the rooms have been left open and steel scaffold barriers have been fitted across their doors to deter access. The hardcore used in the corridor has been eroded in places creating holes, so you have to watch your footing.



Two 3.5 kVA motor alternators (rotary converters) are seen in the radar machine room. This is now the only ROTOR site where these survive

An interesting feature of all the rooms is the triangular ventilation ducting fitted neatly between the walls and the ceiling and in some places in vertical runs in the corners. I've not noticed it elsewhere – it looks very 1950s. Past the main plant room is the GPO room, this is empty with no floor so can't be accessed.

The plotting room is next; this contains the pit for the Kelvin Hughes display which was never fitted. A ladder descends into the pit which is flooded but there is no floor so sadly the room can't easily be entered. It's a shame the pit can't be pumped out. The balcony is complete though I wouldn't have trusted it to take my weight even if I had been able to get to the stairs!



The Track Telling room with plotting room in the corner

Radar Equipment Cabling

Past the plotting room on the right is a large open space which reaches to the end of the corridor; this used to be three rooms. The track telling room was on the right of the space which was L-shaped going behind the plotting room; next were the workshop and the radar office.

All the partitions have been removed as have the floors so if you want to enter it you need to walk on the underfloor ventilation ducting. Of interest here are the underfloor cable ducts still fitted with their sockets for connecting to radar equipment above.



The two level Combined Filter and Plotting Room; the remains of the steps to the balcony are seen at the back of the room.

Below the floor is the flooded pit for the Kelvin Hughes display
 Much of the cabling is also in situ; it had just been cut probably by the decommissioning team to prove the circuits were dead. Even though there were no partitions the site of the workshop was obvious as it had no underfloor cable ducts or ventilation.

Opposite the track telling room on the other side of the corridor is an alcove which contains the hot water tank and a fixed ladder to the storage area over the various toilets and canteens. Past the alcove are the final two rooms, the technical officer's room and the intercept recorder. Both of these are empty with no floor but you can see all there is to see from the corridor.

That completed our tour so we made our way back up the tunnel and braced ourselves for the long climb up the vertical ladder. At the top I paused to have a look at the lift motor room which still has its motor. We all emerged into bright sunshine and were able to walk on the surface across to the surface building above the emergency exit. There were also a number of radar plinths, some reused as shelters for the livestock now on site.

From the edge of the site the massive Victorian moat of the citadel could be seen with the distinct outline of the bunker itself within it (more 'build and cover' than 'cut and cover'). It seems bizarre that the entrance and exit are excavated through and protected by sixty feet or so of solid rock and yet the bunker itself has (presumably) just a few feet of earth above

the concrete shell. Exploration over, we were ready for another cup of tea before making our separate ways home.

Many thanks

Thanks to Geoff Smith of Portland Stone Firms Ltd and Fancy's Family Farm, without whom both visits would have been impossible. Thanks also to John Marquis for arranging the visits and for the usual good company of other members. It was a really good day out.

Photos: Quarry – Gerald Tompsett. Portland ROTOR – Bob Clary

Wonderful Wonderful Copenhagen (and Malmö)

Martin Dixon



Deserted radar control room deep within the Stevns Artillery Fort.

Equipment, manuals and other paraphernalia give the room a Marie Celeste feel. Photo Magnus Hanssen

After Sub Brit trips in and around Stockholm and Gothenburg in recent years, Lars Hansson suggested that there was a lot to see hidden beneath Copenhagen. Lars, Linda, Tony Radstone and I worked together and the result was forty members spending a fascinating Study Weekend here in May 2017.

Copenhagen is Scandinavia's busiest airport and members flew in from around the UK and beyond. Nigel Ostler-Harris flew from Lusaka, having just finished a family holiday in Zambia and got the 'furthest travelled' award. We were also delighted that French member Jean-Philippe Guichard joined us, flying in from Marseille.

Probably the Best Bunker in the World (1)

Friday was a free day but a number of suggestions were made for underground sites that are normally open to the public. One of these was the Carlsberg Museum – admittedly not substantially underground but one of its cellars was used in the Cold War as a plotting room for the Danish equivalent of the Royal Observer Corps. Although the cellars are not normally included on the



The underground Cold War plotting room beneath the Carlsberg Brewery

tourist route, an obliging guide opened up a gas-tight door and allowed photos to be taken of this unexpected bonus. Talking to locals later, it appears there was a fridge in the bunker which was magically refilled during exercises (as volunteers, the staff there apparently had more leeway than the full-time armed services).





The impressive collection of beer bottles at the Carlsberg brewery

Another site which several of us visited independently was the crypt beneath Christian's Church. This Lutheran Church is unusual in that the walls are composed of dozens of boxes for the congregation and is thus popularly known as the Theatre Church. Completed in 1759, the church also boasts an impressive crypt – composed of 48 separate burial chapels. Still in use, there are hundreds of burials here – in fact not really burials as the coffins stand on display for all to see.



Ornate Coffins in the crypt beneath Christian's Church. The wrought-iron gates are private chapels within the crypt.
Photo Martin Dixon

There is also a dedicated lift from the church above to facilitate the final descent after the funeral service. This is of modern construction, unlike the catafalques at West Norwood or Kensal Green designed by Joseph Bramah. There can't be many lifts that only carry a load in a downward direction...

Copenhagen's First Defences

The final site on several people's itinerary was the ruins beneath the Christiansborg Palace. The site has a long and complex history and is now used as a Royal Palace, the seat of the Danish Parliament and the head of the Judiciary. Denmark is unusual if not unique in the world in having these three functions within a single complex. During the most recent reconstruction of the Christiansborg Palace at the beginning of the twentieth century, ruins



The Coffin Lift beneath Christian's Church is an unusual addition to the crypt which was consecrated in 1759. The ramp and covered bier can be seen leading out of the lift doors. Photo Martin Dixon

were found as the foundations were being excavated. The earliest of these ruins came from Copenhagen's first castle, constructed in the 12th century and known as Absalon's castle after the Bishop who built it. The castle was made up of curtain walls and a number of associated buildings. After several sieges and a period of occupation, in 1369 the castle was demolished by forty stonemasons of the Hanseatic League.



Well beneath curtain walls of Copenhagen's first castle. Built in the 12th century, it was known as Absalon's Castle after the Bishop who founded it. Photo Martin Dixon

Later in the fourteenth century, a second castle was built which had a moat and a large entrance tower; it was occupied from 1417 by King Eric of Pomerania. Ruins of this era too were discovered during construction. Such was the public interest in the discoveries that between 1908 and 1917 the remains of both Absalon's and the second castle were preserved underneath the new Palace, protected by a reinforced concrete structure. The extensive remains of the first two stages of Copenhagen's defences are thus still accessible to the public, hidden underground beneath today's Christiansborg Palace. Whilst some of us were visiting the palace, we had a small bonus. Workmen had a manhole open and were checking a sewer that led out from the Palace. Chatting to the

foreman, it turned out that as well as the sewer there was also an escape tunnel beneath that would have allowed the Royal Family to escape to the waterside in an emergency. We could see the brick-paved floor about twelve feet down but our requests to be allowed to descend ourselves were met with a polite refusal. Something about *sundhed og sikkerhed* (health and safety).



Maintenance gang inspecting the sewers and escape tunnel beneath the Christiansborg Palace. Photo Martin Dixon

Before starting on the visits of the weekend proper, it's probably useful to summarise later periods of defence construction in the city. The defences remain remarkably intact and tell the story of the defence of Copenhagen from the Middle Ages through to the Cold War.

Ramparts and Bastions

In the seventeenth century, under King Christian IV, Copenhagen was significantly enlarged and fortified with earthworks and bastions. To the west, ramparts were built which, along with moats, can still be discerned at Tivoli and the Botanical Gardens. To the north a fort (*Kastellet*) was built. To the east, land was reclaimed and more ramparts built – these now form the district of *Christianshavn* (Christian's harbour).

During 1658–59 the city was besieged by the Swedes who were successfully repelled. In 1801 it was the turn

of the British, who fought a major battle with the Danish navy in the harbour. It was during this battle that Nelson famously put his telescope to his blind eye, thereby not seeing Admiral Parker's order to cease fire. The British again attacked in 1807 and caused extensive damage to the city with the onslaught including rockets which caused extensive fires.

The third era of fortifications was in the late nineteenth century, when a rampart and ditch were built to the west (*Vestvolden*) with associated bastions and batteries. Coastal batteries and inland forts complemented *Vestvolden*. The whole was built following the principles of Henri Brialmont (1821–1903), a military architect sometimes nicknamed the 'Vauban of Belgium'.

World Wars

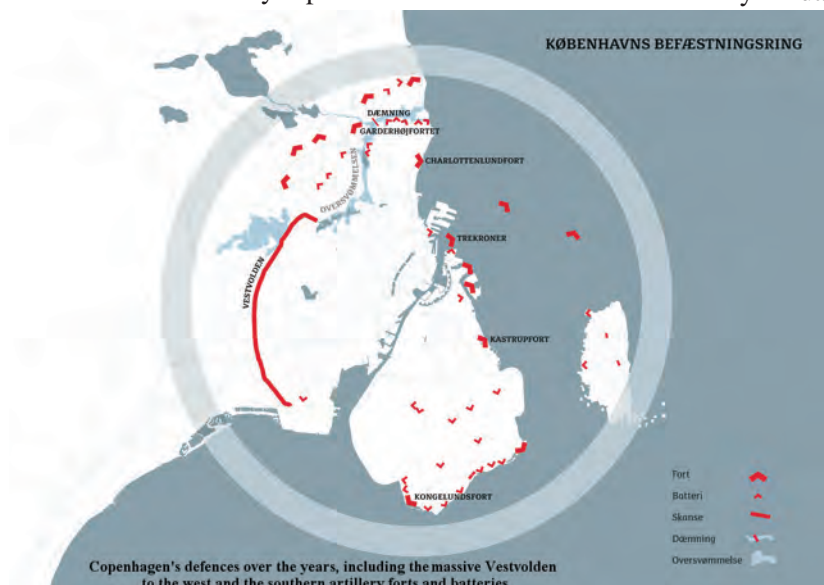
Early in the twentieth century more coastal artillery forts were added, including Dragør Fort and Kongelundsfortet. Denmark remained neutral in World War I but in World War II was invaded by Germany and became first a Protectorate and later an occupied country. Many German-built bunkers remain from this period, especially around the west coast of the country. Most of the country was liberated in May 1945 by British forces under Montgomery.

Moving on to the Cold War, Denmark joined NATO in 1949 and the country, and the island of Zealand (on which Copenhagen is situated) in particular, became known as the 'cork in the Baltic'. This as the Soviet fleet would have to pass very close to Denmark to leave the Baltic (and similarly of course, the NATO forces entering the Baltic). As such, Copenhagen became a key target for Soviet forces in the event of conflict, both for its strategic position and as a stepping stone to Sweden and Norway. Our Sub Brit Study Weekend would take us to sites representing all of these different phases, using a variety of transport options – on, above and, of course, below the ground.

Small but Perfectly Formed

By Friday night, we had all arrived at our hotel – the *Cabinn Metro* in the modern suburb of Orestad. The hotel rooms were designed to make optimum use of space in the same way as a boat cabin, hence the name. Clean and tidy, the rooms were very cost-effective for Denmark but a little on the small side. You could literally clean your teeth while sitting on the toilet – and indeed have a shower at the same time!

Saturday morning dawned and our first underground experience was the very efficient Copenhagen Metro system. Planning for the Metro started in 1992 and construction started in 1996. It opened in stages between 2002 and 2007 and has two lines – M1 and M2. The two lines share a common track from Vanløse but



Copenhagen's defences over the years, including the massive Vestvolden to the west and the southern artillery forts and batteries





split after Christianshavn, one branch (M1) going to the terminus and depot of Vestamager and the other (M2) terminating at the airport.

In total the system covers 20.4 kilometres and has 22 stations – nine of which (in the centre of the city) are underground. These were built by excavating station boxes and building top down. The surface of the underground stations has glass pyramids which provide a degree of natural light within.

The trains are driverless and operate 24 hours a day, with a frequency of up to every two minutes, reducing to 20 minutes off-peak. The trains are three cars long but the platforms are long enough to accommodate four cars if extra capacity is needed. The island platforms are equipped with platform-edge doors (even at surface stations) as a security measure. The system carries about 57 million passengers a year.

Metro Maintenance and Control

We boarded at Ørestad and had time for a quick excursion to the end of the line at Vestamager to view the depot from the platform. Maintenance and Control is centred on a three-acre site accessed beyond the terminus by a descending and curving track. All maintenance is carried out here and the site has a total of five kilometres of track for storage and testing. Diesel locomotives are also housed here for maintenance or breakdown recovery.

We noted that, unusually, ‘next train’ arrival times are indicated to the nearest ½ minute. One of the simplest but most inventive features of the trains is a small stick-on plastic instrument panel in all the front cars. This allows youngsters (and Sub Brit members!) to pretend to drive the train, make announcements and open and close doors etc. Perhaps something that other operators (and Southern Rail?) might usefully adopt.

An extension of the system is being built at present, known as the ‘CityRinggen’ or Circle line. This is a completely new line (M3), although it will intersect the existing lines at Kongens Nytorv and Frederiksberg stations. It will also extend the metro to Copenhagen

Central Station – a current weakness. Totalling 15.5 km, the CityRinggen will have seventeen new stations – all underground. A small viewing platform at Kongens Nytorv allows visitors to see the construction site and view display panels with information about the construction. Opening is scheduled for 2020.

Cold War Playground

We left the Metro at Christianshavn and had an excursion to view the city’s seventeenth-century ramparts. Unexpectedly, the first structure we noted was one of a number of Cold War civilian shelters, all accessed by a slit passage and with a square surface structure which was used for ventilation and emergency exit purposes.



The slit trench entrance to one of Copenhagen’s Cold War civilian shelters was conveniently open

Most of these shelters were sealed but one was open and allowed us to view the interior. Intriguingly, some of the shelters had been incorporated into a children’s playground and the exit shafts left in place and used as seating area and tables.

Elsewhere on either side of the substantial moat were the original defences. The moat had to be shallow enough to prevent large ships gaining access but deep enough to prevent invaders simply wading across.



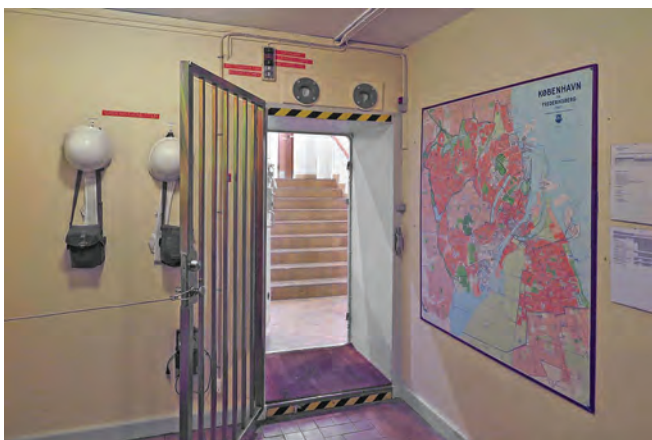
Some of the emergency exits from Cold War shelters have been incorporated into a children's playground as seating areas. Photo Martin Dixon

There were the remains of several magazines and accommodation blocks but most of the barracks are now part of the 'freetown' of Christiania, established in the 1970s as an alternative community with squatters taking up residence in the abandoned buildings. The residents now have some autonomy and provide a colourful backdrop.

Frederiksberg Civil Defence Bunker

Our morning continued with a metro-ride to Frederiksberg and a short walk to its impressive Town Hall which although started in 1942 was not completed (due to World War II) until 1953. Beneath the Town Hall is a Civil Defence Command Post, built as one of 23 within Greater Copenhagen.

The city was split into regions, and further subdivided into sectors. This site was codenamed AFR – Afsnit (Section) FReideriksberg. As the Town Hall was the administrative centre for the neighbourhood (it still employs around 800 people today) it was the logical site for the bunker.



The main entrance to the Frederiksberg bunker. The outer blast door can just be seen, as well as the second security door. Above the door lintel can be seen pressure valves and the coloured lights indicating alert status. The map on the right dates from 1967 and shows the limits of Frederiksberg within Greater Copenhagen

The bunker occupies about 400 square metres; through the first air-locked blast door was a side room holding the emergency generator. Sadly this was the one area not accessible to us as it still provides standby power for the whole building. Within the airlock were decontamination facilities. Inside the bunker, a central control room (*situationsrummet*) is surrounded by rooms for support staff. Our guide was ex-Civil Defence and had worked in this very bunker so knew the ropes well.

We had a short presentation about how the system would have worked. Alongside a marked-up map of the suburb; coloured metal symbols were stored on a rack. These would have been hung on different 'area' grids to show what resources were available and what was already deployed in different areas. For example a red symbol was equivalent to twenty firemen and their appliances. Another indicated six ambulance workers in three ambulances. This system is believed to have been unique to Denmark.



Briefing by an ex Civil Defence leader within the Frederiksberg bunker. We are being shown the system of hanging tokens that were used to monitor the deployment of emergency services and rescue parties. The map on the left is dated 1999, the last year the centre was used for exercise. The small TV monitor is a more recent addition and used as part of school visits

Observation Posts

Schools would have been used as mobilisation centres and we were told that 100,000 stretchers were available for a population of around the same number. Presumably, after a serious incident the first message to control would be '100,000 injured, send 200,000 stretcher-bearers'! Observation Posts located atop three towers (including the Town Hall itself and one at the nearby Carlsberg Brewery) would have been used to triangulate and report damage. In the worst case, areas for mass burial had been identified and were marked on the control map.

After the presentation, we had free time to explore for ourselves. Around the central room was one room for the police (*politi*) but most of the rest were for the civil defence. Adjacent to the control room was a communications room (*signalrum*). Other main rooms included those for dining, resting etc (*oppholsrum*). These could also be changed into sleeping quarters if needed.



*Dormitory in the Frederiksberg Civil Defence Bunker.
On the far wall is one of the three emergency exits*

Toilets and a small kitchen completed the accommodation. Two half-height emergency exits were also provided in case the main entrance became unusable due to falling or collapsed masonry. There was also a manhole which led to a lower basement which we persuaded our guide to let us lift but not enter.

A bank of lights throughout the bunker gave a current status position as follows. From the top down the lights indicated:

- Air Raid in progress (Red)
- Bunker in shutdown (Amber)
- All systems operational (Green)
- Head of Police present (White)
- Head of Fire Service present (White)

We were delighted to find that both the lighting control panel and the slave displays throughout the bunker still worked perfectly. Sixty people would have operated in the bunker for a 48-hour shift. The last known contingency exercise in the bunker was in 1999 but it remains perfectly preserved. To its credit, the municipality opens it regularly for visitors and many schools visit as part of their history syllabus.

If it ain't Baroque...

Emerging blinking into the sunlight, we had time for a picnic lunch in Frederiksberg Gardens before passing the eponymous baroque Palace to enter the *Søndermarken* (literally 'Southern Field'). Here we were to visit the *Cisternerne* (Cisterns), a once-forgotten subterranean reservoir that originally contained the supply of drinking water for Copenhagen, holding as much as sixteen million litres of clean water.

In 1853, a cholera epidemic cost the city more than 4,700 lives, where the source of infection was the highly contaminated water from the city's many wells. Clean drinking water therefore became a priority and the cisterns were a key part of the solution. Excavation started in 1856, and the reservoir was completed three years later. Originally, the reservoir was open to the elements and provided pleasant reflections of the nearby Frederiksberg Palace. To reduce the chance of pollution the reservoir was covered over in 1891. On the same occasion, a lawn

was built with a fountain in the middle. The cisterns ceased to function as a drinking water reservoir in 1933, and were finally drained in 1981.



The emergency exit from the Cistern in Søndermarken Park in Copenhagen. The glass roof provides light to the art installation below, where moss and other plants currently grow within the reservoir

The cisterns cover 4,320 square metres and consist of three equal spaces. The ceilings are 4.2 metres high with a maximum designed water level of 3.7 metres. The walls in the Cisterns are built of sturdy granite blocks, the floor is cast concrete, the pillars bearing the ceiling are masonry, while the ceiling itself is made of moulded concrete.



The interior of the Cistern. The walkway forms part of the art installation as shallow water now completely covers the floor of the reservoir. The masonry pillars and cast concrete roof can also be seen

In 1996, in connection with Copenhagen's status as European City of Culture, the underground water reservoir was put to use as an exhibition space. Today, the Cisterns form an integral part of Frederiksberg Museums, acting as a venue for art exhibitions and other events where the singularity of its architecture and atmosphere remains a core attraction.

Wet Wet Wet

In 2017, to celebrate 150 years of diplomatic relations between Denmark and Japan, a variety of cultural events are taking place in both countries throughout the year. These include "An ambitious exhibition in the Cisterns (which) will be a journey through an underground sea of light and darkness, when the internationally acknowledged Japanese architect Hiroshi Sambuichi modifies the monumental halls."

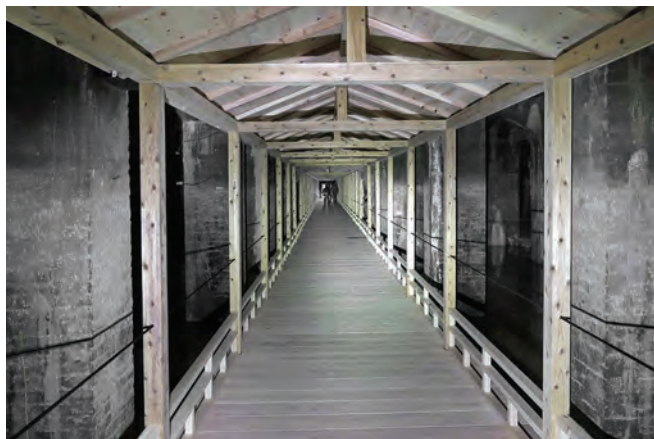
The Water is Sambuichi's first major exhibition outside Japan.



“Water will again fill the Cisterns; daylight will penetrate and plants will grow in the special, CO₂-saturated climate. The visitor will wander over the water on an interpretation of the Japanese Itsukushima Shrine on the island of Miyajima.”

The exhibition’s website also warns: “Visitors should also be prepared to step into a darkness. Weak and endangered should be extra careful!” We followed the directions and entered almost complete darkness – despite our instincts, we were urged not to use torches or flash which might destroy the artistic intent.

Eventually, walking along well-fenced walkways raised above the floor level, we emerged into an area of the reservoir with a water spray, natural daylight and a complex arrangement of mirrors. Here we could see the original construction details but also appreciate a novel installation for a derelict industrial space.



The long walkway gives an idea of the massive size of the Cistern. The walkway is traversed in almost complete darkness, leading to natural light at the end which is reflected by a series of mirrors

Further along the walkway a wooden bridge crossed over the water, illuminated with Japanese lanterns. Elsewhere a surface camera obscura beamed its image onto a back projected screen where we could view the Frederiksberg Palace and other visitors enjoying the spring sunshine. Although the art installation might not have been to everyone’s taste, it did allow the cistern to be seen with water in it once again – albeit only a few inches deep.

Central Station

Our visit over, we walked and took an ‘S-Tog’ (Suburban) train to the Central Station, the third on the same site and opened in 1911. Outside, the main station building is a mixture of brick and granite and inside a fine wooden roof covers ticket offices, cafes, shops and circulation space. The twelve platforms are all underneath the concourse and have been escalator-connected since 1980. We met under an impressive chandelier to continue our journey (at least most of us did – note to future visit organisers, always specify which of the two chandeliers you intend to meet under!).

We took the S-tog again to Østerport (East Gate) and walked around the adjacent Castle’s double moat to Churchill Park – so-called as it holds a bust of Winston Churchill commemorating the liberation of Copenhagen



The impressive wooden vaulted ceiling in Copenhagen’s Central Railway Station, dating from 1911. Just like the UK, weekends often mean line closures and a team is replacing the track to the left

by British Forces. Work has also started here on an underground (literally and figuratively) museum to show the work of the Danish Resistance in World War II.



Cold War civilian shelters grouped around Copenhagen Castle moat

Entering the Castle (Kastellet) proper, we found an impressive array of buildings, many still used by the military. The Chief of Staff has offices here and the military barracks are still in use. Other buildings include a windmill – installed in order to improve the garrison’s ability to withstand a siege, although some members postulated it could also have been used for gunpowder manufacture.



The impressive Kings Gate – the main southern entrance to Copenhagen castle (Kastellet), dated 1663. The bust is of Frederik III

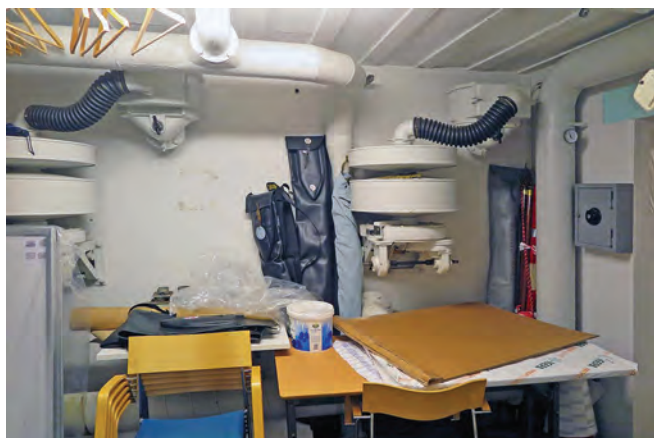
Our own destination was an extra to the published programme. Whilst researching the castle site for our visit, Lars noticed one of the plans marked a bunker. He approached the current castle Commandant who explained that the site is used as a 'club house' by the Danish, UN and NATO Veterans participating in foreign missions (think more 'British Legion' than Chelsea Pensioners!).

Probably the Best Bunker in the World (2)

The Veterans kindly arranged to specially open the bunker for our visit and it turned out to have been built by the occupying Germans in World War II. Situated adjacent to the Commandant's House in the castle, it turned out to be a standard design German Command Bunker (model R608). The structure is in an excellent state of repair and we enjoyed a pleasant drink whilst exploring the inside or outside in the pleasant adjacent garden. A relaxing end to a long day's exploration.



The largest room in the German-built WWII type R608 command bunker. Behind the United Nations beret is a machine gun loophole which covers the entrance passage



Ventilation and filter stacks in the German type R608 command bunker

Suitably refreshed, most of the party took the riverboat service back to a Metro station and then had time to freshen up before enjoying a generous buffet a few hundred metres from our hotel. Returning to the hotel we found the management had a relaxed attitude to us imbibing our own duty-free or supermarket drinks and we whiled away the hours until it was past our bedtimes. It was Eurovision night which most of us studiously avoided, but one or two couldn't resist.



A busy scene after a busy day as the group eat a sumptuous buffet meal

Underground, Overground

Sunday dawned and with the sun beaming down we walked to Orestad Station once again. As well as being on the Metro line, there is also a mainline station here and we were able to catch the 0933 direct to Malmö Central in Sweden via the Øresund Crossing.

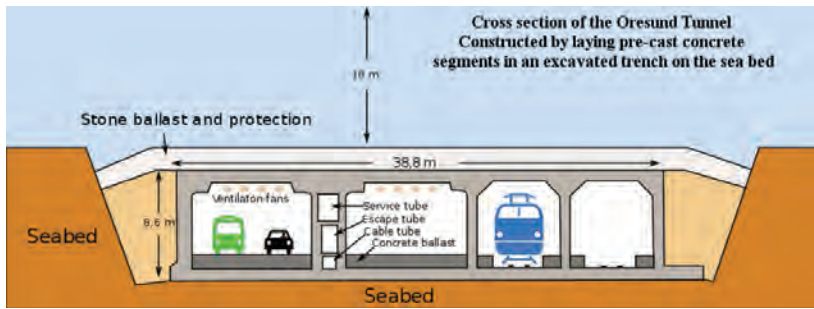
This is a sixteen-kilometre-long road and rail link between Sweden and Denmark. Construction began in September 1993 and the crossing opened in June 2000, when thousands of people cycled, ran or walked over the link on special 'Open Bridge' days. The crossing has also become famous as the setting for the TV thriller *The Bridge*, written by Hans Rosenfeldt.

The concept of a fixed link across Øresund (literally 'Ear Strait') is not new. For centuries, Øresund presented an obstacle to the transport of passengers and freight between Sweden and Denmark. On the other hand, it also provided protection in times of conflict between the two countries, most recently during the German occupation of Denmark.

From the beginning of the twentieth century, several proposals were put forward, although a lack of financing and political support meant that the proposals never got past the drawing board. Stable political and economic environments in both Sweden and Denmark towards the end of the century, however, laid a new foundation for the project.

The crossing consists of three sections: a bridge, an artificial island and a tunnel. The bridge accounts for half the length of the link (approx eight kilometres) with the two 204m-high pylons supporting the 490 metre bridge-span across the Flinte channel. On the bridge, the railway and motorway run on separate levels with the railway on the lower deck and vehicle traffic on the upper deck.

Most of the bridge structures – the bridge piers and bridge spans – were built on land and subsequently towed out to the bridge alignment by a large floating crane. The Swedish end had to be realigned to avoid a then-active coastal artillery battery which wasn't shown on the planners' maps.



Construction started in March 2005 and the line opened in December 2010 – six months ahead of schedule. A new intermediate station named *Triangeln* was constructed by sinking two 25-metre shafts and then using roadheaders to excavate the platform area. The station at Malmö Central was excavated by cut-and-cover construction of an 800-metre box.

Salt and Pepper

The four-kilometre immersed tunnel was built from concrete elements cast on land and subsequently towed out and lowered into a trench dredged in the Øresund seabed. Linking the bridge and tunnel is the man-made island of *Peberholm*, where the railway and motorway run.

Peberholm was constructed from the material dredged from the Øresund seabed to accommodate the bridge piers and the tunnel. The island’s name (it translates as ‘Pepper Islet’) is a playful reference to the neighbouring natural island of *Saltholm* (‘Salt Islet’).

Peberholm was built to enable traffic to pass between the bridge, where rail and vehicle traffic run on two levels, to the tunnel where traffic runs on the same level. Public access is not allowed and it serves as a nature reserve allowing scientists to monitor species in an undisturbed environment. Over five hundred species of plant have been identified, along with many fauna including the rare green toad.

The crossing was exceptionally smooth, with ticket, passport and customs checks all carried out during the journey. Announcements were made in three languages (Danish, Swedish and English). On reaching mainland Sweden, we passed through Malmö City Tunnel (*Citytunneln*). This is a 17-kilometre rail link, built to route traffic from the Øresund Crossing to central Malmö.



The newly built subterranean platforms at Malmö now allow the through-running of Øresund trains to destinations further within Sweden

Spitzbunker

On a glorious spring day, we had time to explore some of the defences of Malmö City from different eras. Firstly we walked to a German-designed above-ground air-raid shelter (a type of *hochbunker*, literally ‘highbunker’).



The train to Malmö speeds effortlessly through the Øresund Tunnel

Six kilometres of the route are in tunnel, mostly constructed using Tunnel Boring Machines (TBMs). The new station at Malmö Central changed it from a terminus to a through station. This allows through-running trains to the rest of Sweden.



Malmö’s Spitzbunker of cast concrete and an iron-coned roof has protected status reflecting its rarity

This dates from World War II and is also known as a *spitzbunker* ('pointed bunker') or Winkel Tower, after its inventor. The neighbouring Kockums Shipyard had dealings with Germany in the 1930s and this no doubt gave them access to the German design.

Within Germany, 98 examples of this type of air-raid shelter are known to have been built, mostly around factories and stations, especially where the local geology was not suitable for underground shelters. Although it is hoped to open the shelter for enthusiasts, at present we had to be content with viewing from the outside.

Next we walked back into the centre of town to view the site of a Cold War civilian shelter. Swedish policy was to provide protection for all civilians in public shelters, which are universally marked with a blue triangle on an orange background labelled *skyddsrum* (shelter). Before reaching our destination, we passed another smaller shelter from the same period just beyond the train station.

Cold War Shelters

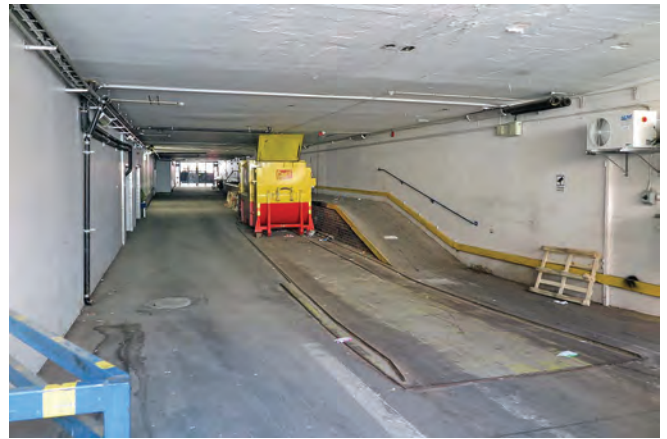
This happened to be open and was being used as a cold store by the neighbouring kebab stall. With the permission of the somewhat bemused owner, forty of us quickly descended to view the interior. The bunker was particularly well supplied with food (lettuce and chilli sauce only for vegetarians!). According to the Swedish authorities' MSB map which covers all shelters, it was numbered 160269-6, is active and can accommodate sixty people.



Our unscheduled entrance into the Skyddsrum (shelter) number 160269-6, adjacent to Malmö's Central Station

We continued onwards to visit the site of a larger Cold War public shelter. From the 1950s onwards, all new buildings had to include a shelter, usually in basement space. Although we couldn't gain access we could see the entrance blast doors to a huge shelter that could hold over 1,800 people. Today the top level of the shelter is a gym and the lower level is a car park.

Even now the rules say that the space has to be able to be converted to its shelter configuration at 48 hours' notice. The two floors would be fitted out with tables, chairs and beds. Other services such as generators, air-handling and kitchens would also be provided to sustain those sheltering, at least until the worst of the fallout had passed.



Entrance Passage to the large two-storey underground shelter, used as a gym and a car park. Blast waves would hopefully have passed through this passage and helped protect the bunker entrance to the left

Pillboxes

Finally we met up with Torbjörn Anderson, a local enthusiast and community employee. He had arranged access to a couple of World War II pillboxes that once protected Malmö's coastline.

To ensure Sweden's neutrality wasn't threatened, an extensive line of defences was built around the south of Sweden. These were known as the *Skåne* or Per Albin Line and included pillboxes every three or four hundred metres.

Most of these, some angular and some circular, held machine guns. Every tenth or so pillbox was different, designed to allow a 37mm anti-tank gun to be rolled in and improve the firepower against heavier armoured vehicles.



World War II machine-gun pillbox in Malmö, renovated and specially opened for us by local enthusiast Torbjörn Anderson. The observation tower can be seen on top

First we visited a machine gun post in the centre of town, kept in good order by the council and volunteers. Normally the entrance is blocked by a concrete slab but Torbjörn had arranged for forklifts to remove this especially for our visit. Inside was a small tower with iron staples that could be ascended. At the top a speaking tube still provided communication with the crew below. Grenade chutes were also provided to repulse close-quarter assaults.

The second site we visited had a larger entrance door – presumably just wide enough for a 37mm Bofors anti-tank gun. Inside, recesses in the floor of the pillbox would have accommodated the gun's split trail to keep the gun in place when fired. This larger bunker also had a small observation tower. In one corner could be seen the remains of a small heater installation to cope with the harsh winters. As well as the gun port, grenade chutes were once again in evidence.



Main firing loop in the anti-tank pill box; a smaller loophole on the left can also be seen. The wooden planking on the floor covers recesses which would have held the gun's split trail to reduce recoil

During the break for lunch many chose to visit Malmö Castle, an impressive moated structure dating from the 1530s but with no casemate access. Within the castle is a technology museum which amongst other exhibits houses a Kockums U-boat which can be boarded.

Over and Under

Meeting back at the station, we added a new form of transport and boarded a coach for the return trip to Denmark. We had an en-route stop to view the bridge from a nearby viewpoint. This was the original artillery fort that had influenced the location of the Swedish end of the bridge.



This Observation Post is all that remains visible of the coastal artillery fort that once protected the Øresund Strait. Originally housing three 75mm guns, it was rarely used on exercise due to its proximity to the busy Øresund Strait and the closeness to Danish waters. Today it is completely covered over apart from the observation post whose concrete roof was being used as a barbecue. From

the viewpoint the enormity and beauty of the bridge could really be appreciated.

The return coach toll for the crossing is around £175 but it was well worthwhile as the view of the structure was better from the top deck of the bridge. As we approached the tunnel portion of the crossing we drove over *Peberholm* and drove alongside the railway, below us on the bridge. The reason for the tunnel became clearer – the crossing terminates precisely at Copenhagen Airport and a bridge would have provided a navigational hazard during the use of certain runways.



Our return coach journey to Denmark – about to transition from bridge to tunnel on Pepper Islet. The middle portal houses the eastbound road carriageway; the wider portal for the two rail tracks can be seen to the left hand side

Kongelunds Fort

Our penultimate site of the day once back in Denmark was Kongelunds Fort (originally called Kongelund's Battery). It was built between 1914 and 1916 with four 29cm howitzers as its main armament. In addition there were four 75mm and two 47mm cannons. The task of the battery was to protect the minefields that were being laid out in Køge Bay in the event of war in order to prevent enemy naval forces from operating in these waters.



Observation bunker at Kongelunds Fort

The armaments were updated in 1938 to four 15cm guns, relocated from the coastal defence ship *Herluf Trolle*. During the German occupation in World War II, eight 15cm Skoda guns were installed. In 1959 the fort became a radar installation for Nike missiles and we spent time exploring the radar platforms from that period. Doors

to underground magazines and passages were sadly all locked although the moat retained some interesting iron-armoured caponiers. The fort was decommissioned in 1982 and is now owned by the local authority.



Platforms at Kongelunds Fort which would have housed the Nike anti-aircraft radar heads. Members took full advantage of the free access arrangements



Unusual iron caponier protecting the moat of Kongelunds Fort which can still be seen in water beyond it

Dragør Fort

We experienced a spell of rain but after a short drive arrived at Dragør Fort in brilliant sunshine once again. The fort was built in the period 1910 to 1914 on an artificial island, approx 400 metres from the coast immediately south of Dragør village. The fort corresponds exactly to Saltholm flak fort (later *Flakfortet*) in the straits which was constructed at the same time.

The fortress's mission was to help prevent enemy bombing of Copenhagen, prevent a hostile landing on the Amager southern coast and prevent enemy shipping operations in Drogden and Flinterenden. It's still surrounded by a moat, but most of the water between it and the original coastline has now been infilled and reclaimed.

We were treated to an informative and entertaining tour by Torben Bødker, its current owner, who bought the fort in 2002 for around 3.4 million Danish krone (say £400,000). Torben lives in the former Officers' Mess and his daughter in the former Guardhouse! The Fort is run as a small hotel and conference centre but the conversion has retained almost all of the original layout and services. To quote the hotel website, 'It is exciting and at the same time a little forbidden'.



The final site of a full day – the impressive entrance to Dragør Fort showing its construction dates of 1910-14. Now in use as a hotel, most of its key features have been preserved



The impressive entrance hall to Dragør Fort today. Rails can just be discerned either side of the red carpet welcome we received. The board to the right is the original duty board, showing crew allocations to various posts

The rooms nearest the entrance were barracks and less well protected, with flat ceilings. Many of these now form the hotel's bedrooms – the beds of which seemed as large as a complete bedroom at the *Cabinn Metro*. As we progressed further underground, the rooms had vaulted ceilings and originally housed magazines, plant or control rooms. Between the two types of room ran a long corridor with ablution blocks. Much of the floor still had rails in place for the movement of shells (or according to Torben, awaiting the extension of the Copenhagen Metro!).

Power and Glory

Of particular note were two splendid diesel generators, dating from the 1950s and in full working order. They have only around 600 hours on the clock and the room had that unmistakable smell of well-oiled machinery. In a couple of places spiral staircases led up to the gun emplacements above. After our guided tour of the hotel area, we were free to wander around up top and try and make sense of the many phases of armaments.

In terms of what lay above ground, we learnt it was originally equipped with four 35.5cm howitzers and various smaller pieces. In World War II the Germans moved most of its heavy armaments to the Atlantic Wall. During the Cold War it was re-equipped with three double 40mm anti-aircraft guns.





Generator and switchgear within Dragør Fort



Gun emplacement atop; the Øresund Bridge is visible in the centre distance

Again, in the 1980s, the fortress was re-armed with two 76mm anti-aircraft guns. We were able to scramble into the battery observation post, and down into the emplacements and their ready stores. The most recent of these held racks with removable trays, shaped to hold the anti-aircraft shells.



Passages beneath Dragør Fort, connecting the magazines below and gun emplacements above

Our visit to Dragør concluded with a glorious meal within one of the fort's original dining rooms. The tables had been decorated with candelabra and we enjoyed a seemingly endless buffet prepared by the hotel's team. It was a great opportunity to get to know our newer members, as well as to cement those friendships which in some cases have lasted almost forty years.



The original dining area at Dragør Fort transformed into the venue for Sub Brit's evening meal; it's not often we dine with candelabra and linen tablecloths. Original blast doors can be seen on the right-hand wall. Photo Martin Dixon

Air Defence Headquarters

That a capital like Copenhagen would have an air defence is no big surprise. In the Cold War, enemy planes could reach the city in less than ten minutes so things had to work fast. After World War II Denmark acquired 90mm anti-aircraft guns from the United States. With a range of 8.5 km they were good enough up until the mid-1950s.

With the arrival of much faster jet bombers, artillery became obsolete and the US sent the modern Nike missile system to Denmark. With a range of 160 km and radar-guided all the way to the target, it became a great update of the defence of the capital.

Batteries with missiles were placed in a ring around the city and also elsewhere in Denmark. To control these new defences, from 1954 all air defence in the greater Copenhagen area was controlled from the Ejby Air Defence Bunker, in the Rødovre suburb to the west of Copenhagen. The centre had contact with individual batteries as well as the surveillance radar stations. With computer communication the centre could send information to a single battery radar, telling it what target to aim at.



The exterior of the Ejby Air-Defence Bunker, built within the earlier Vestvolden. Nature is now adding its own coat of camouflage

Early on Monday – with the same bus but a different driver – we made our way to Rødovre. The coach was boldly labelled *Treasurer Subterranea Britannica* but Tony was kind enough to share it with the rest of the group.



Sub Brit is fortunate as, unlike some other industrial or military history societies, we have always attracted members of all ages. We asked Thomas Hughes, the youngest member on our Copenhagen weekend, for his impressions:

Hello, my name is Thomas Hughes. I'm sixteen years old and I've been a member of Sub Brit for around six years now. I have accompanied my Dad on quite a few Sub Brit trips over the years and I have got to know some of the other members quite well. I recently accompanied my Dad on the study weekend to Denmark and Sweden. I found the trip was very educational and thoroughly enjoyable.

The highlight of the trip for me was when we visited the Bridge and Tunnel on the way to Malmö in Sweden, which I thought was an amazing piece of engineering. I am currently sitting my exams and in September I am hoping to attend Engineering College in Newhaven.

On the last day of our trip the group visited a former top secret military facility known as Stevns Fort. I found this facility amazing as some of the main rooms still contained equipment from when the bunker was active. I found it fascinating the incredible lengths the Danish military went to keep this facility top secret.

I am already looking forward to the next study weekend next year!



Thomas Hughes in front of the Stevns twin barrelled 15 cm gun. Photo Jason Hughes

We were pleased to welcome local member Allan Pelch who joined us for the day. We assembled outside the Ejby Bunker, built within the earlier Vestvolden defence ditch. There we were met by another Martin, our knowledgeable



Our enthusiastic and knowledgeable host Martin introduces the site to Sub Brit members. Note the tank traps in the far distance

guide, and entered the bunker through blast doors. The whole construction had the feel of a UK anti-aircraft operations room, which we learnt was not a coincidence but because the design was indeed based on the UK's experience in World War II.

Operations Room

We started in the centre of the bunker, in the two-level Operations Room. Like the rest of the bunker, most of its contents have been recreated as the original artefacts were lost upon closure. Here we were given a summary of the history of the site and then given freedom to wander the site. The main plotting board has now been replaced with a computer simulation that allows visitors to experience the tension surrounding the Cuban Missile Crisis and to try and take actions that prevent World War III (we failed).



The Operations Room at Ejby Bunker, viewed from one of the balconies. Those on the floor itself are battling to avert World War III (unsuccessfully as it turned out!).

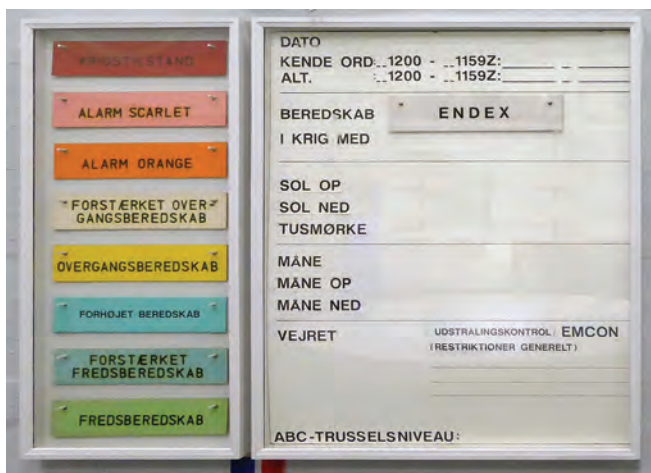
The equipment is part of the modern educational installation and not original



The protected entrance to the Ejby Bunker

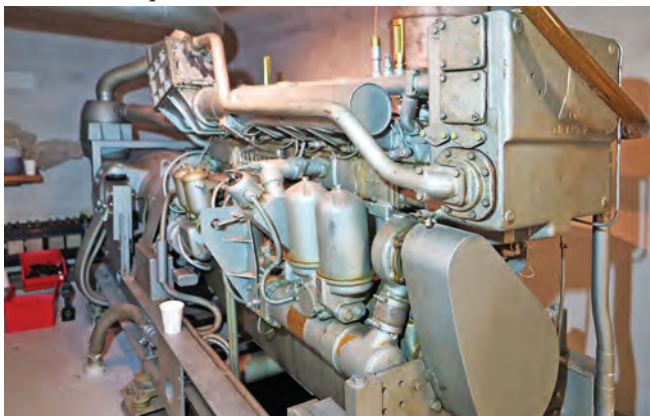
Within the Ops Room one original part of the bunker remains. This is the Status Board which displayed information such as the security level the country was at and local sunrise and sunset (and the same for the moon). Most bizarrely (and we were assured this was not a joke), the board showed what country Denmark was at war with! Luckily it displayed 'End of Exercise' throughout our visit.

Around the operations room ran a corridor, with other offices, dormitories, dining room etc located around the outside. Each room had a label in the corridor but as these were largely Danish acronyms it didn't succeed in making the set-up any clearer to us. Most of these rooms now hold displays or recreated offices, with some well-thought-out games aimed at schoolchildren which helped explain the history and purpose of the bunker and of the Vestvolden in which it is built.



The original status board within the Ejby Air Defence Bunker. As well as the expected threat level, sunrise and weather information, the second box bizarrely includes 'Who we are at War with'. Luckily 'Endex' (End of Exercise) is on display at present. Photo Martin Dixon

One of the few remaining rooms that is intact is the generator room. The big diesel engine is still standing with all its ancillary equipment. Martin had arranged for one of the engineers who worked on site when it was active to come in so he could explain the set-up and answer our questions.



Diesel Generator within Ejby Bunker; one of the engineers who worked on the plant when the site was active had come in specially to help answer questions

In 1971 the air defence role merged with a bigger NATO-controlled bunker in Vedbaek and the Ejbybunker turned into a communication centre as well as the wartime HQ for Military Region VI, in charge of the defence of Copenhagen and northern Sjælland. The military left in 2001, unfortunately taking almost all their equipment with them before the Danish Nature Board got to take over the bunker. It opened as a museum in 2012.

Vestvolden

Having spent a delightful time exploring the bunker, we followed Martin to some Vestvolden sites that have also been preserved. The Vestvolden was a defence line around nine kilometres from downtown Copenhagen. It stretches over 14 km and complemented coastal and other land defences to protect the capital from attack.

It was built between 1888 and 1892 with trenches, ramparts, moats and underground defences. During its active days until 1920 there was a standard-gauge railway along its length that transported equipment between the different parts of the wall.

Vestvolden translates literally as 'West embankment' but is better translated as 'Western defences'. It is contemporary and equivalent to the Portsdown Forts above Portsmouth – facing inland to prevent a flanking attack from taking the capital by land. The well-preserved remains are today put to more peaceful recreational uses: museums, picnic areas and running and cycle paths.

The first site we visited was one of the ten permanent gun batteries and its integral underground magazines. The latter were double-walled for damp control with separate magazines for shells and cartridges. There was just room to squeeze round the air gap provided we all went the same way round.



Gun Battery with associated underground magazines at Vestvolden. The guns themselves were kept nearby under cover apart from exercises and hostilities

An elegant elevator to the gun positions was preserved as were the illumination windows around the magazine. We learnt that the firepower would have been 12cm wheeled guns – largely kept under cover during peacetime to prevent deterioration, and wheeled into position in times of tension.

Plinth of Darkness

We continued our exploration and climbed up onto the ramparts from where the substantial canal or moat to the west of the wall could be seen. The area is also used for



Ammunition Hoist within the magazine of the VestVolden Gun Battery. The text translates as 'maximum load 480kg' the grazing of sheep who listened attentively; they looked suspiciously like the famous Borrowdale Greybacks we have encountered on previous Sub Brit trips. We passed a small emplacement for a ranging station a little outside the gun battery and then descended towards the moat. Here we entered a double flanking caponier within the moat; these were built every 600 metres to fully protect the defences. Cleverly, half of the building had seen minor restoration whereas the mirror image was in 'as found' condition.



Twin Caponier within the moat of Vestvolden. The second opening from the right is where the searchlight would have emerged from on overhead rails to illuminate the moat

What was particularly impressive were the two searchlights on overhead tracks which would have slid outside (on the 'friendly' side) and illuminated the ditch in the event of attack. The 'restored' half showed where the soldiers would have slung bunks. In the unrestored portion could be seen the plinth where a generator would have powered the searchlights, mains electricity being unavailable in 1890. Finally we looked round a restored surface building which was the store for the six 15cm howitzers which would have been used along the wall. Sadly all the original guns had been scrapped. As in a modern train depot, a traverser outside the main doors would have moved the pieces onto



The well-preserved interior of the caponier, showing firing positions. The wooden ceiling was added to reduce the likelihood of injuries caused by splinters of concrete injuring occupants in the event of a direct hit

the 'main line'. In the event of conflict, civilian locomotives would have provided the motive power – the defensive lines had a connection with the passenger network.

One final object of interest was a reconstructed 'phony gun' from World War I. This was of the correct dimensions but built of wood and canvas. It has been built to the original plans in conjunction with a local unemployment centre. What has been done with the whole Vestvolden area is a model of how to return military land to nature but at the same time preserving its history. Recreation and military history exist harmoniously side by side (apart from a bunch of Brits keeping to the left rather than the right of the combined footpath/cycle track!).

The delights of Stevns

After an hour's coach ride we arrived at our final site of the weekend and most attendees agreed we had saved the best until last. South of Copenhagen lies Stevns, inscribed on the World Heritage List for the fossilised remains that lie within its chalk cliffs.

These hold one of the world's best exposed K/T (Cretaceous– Tertiary) boundaries. But other secrets also lie here; remnants of the Cold War. On the surface is a powerful anti-aircraft missile battery and deep within the chalk are bunkers and coastal-artillery batteries.

Yesterday we had visited the anti-aircraft radar site at Kongelunds Fort, this morning we had seen the Operations Room at Ejbybunker and now we were to see the 'business end' of the air defence of Denmark. Unlike many countries, UK use of anti-aircraft missiles became restricted to military sites whereas other countries continued to defend populated areas throughout the Cold War.

We started our tour above ground, led by Jan who had himself commanded a nearby Hawk Battery. HAWK was an anti-aircraft missile system, in service from 1970, from the alleged acronym **H**oming **A**ll the **W**ay **K**iller. In 1984 it replaced the earlier Nike system which had also been based at Stevns since the 1960s.

Unlike the Nike system, Hawk was a mobile system and the many components were each housed in wheeled or



Surface displays at Stevns; two Nike missiles, a tank, and behind that our coach

tracked vehicles. A second Hawk unit was based a few miles north near the Stevns lighthouse so the defensive firepower was immense.

Firepower

Essentially the system used acquisition or search radars to identify airborne threats and then tracking or targetting radars to direct the missile which homed in upon the radar signal. Associated units held the Battery Control Centre (BCC) and Platoon Command Post (PCC) and other support functions such as generators and missile transporters.

Most important of course were the missile launchers themselves. There were six of these per battery, each carrying three missiles which could be fired independently. With a spare missile for each one, this made a total of 36 missiles per battery.



Trio of Hawk anti-aircraft missiles at Stevns. The missiles, which would be fired individually, are on a trailer as the whole Hawk system was mobile. The missiles would normally be protected from the weather by a canvas dome which has been lowered and can be seen behind the missiles

Under normal conditions, the launch vehicles were protected beneath canvas domes which could be quickly hydraulically collapsed. The Hawk units were used by many NATO countries (the UK had Bloodhound and Rapier) and their components were fully interchangeable so a Belgian radar could be used to direct a German missile. We were told that within three metres from launch the missile would be travelling supersonically! The warhead

was a comparatively small charge surrounded by thousands of ball bearings – essentially a giant shotgun – which would destroy any incoming threat.

Our lesson in aerial defence over, we turned our attention to the coastal artillery. The bunker, deep within the chalk, was constructed in 1953 as one of two Cold War sites. The second was Langelands Fort on the island of Langeland to the southwest of Copenhagen.

Their task was to control the southern inlet to the Baltic and the outlet towards the Norwegian Sea if the Warsaw Pact forces tried to get out of the Baltic. It was Langelands Fort that detected the Soviet ships taking nuclear missiles to Cuba in 1962.

Turned out *Gneisenau*

Denmark reused many of the German-built World War II gun positions and modernised them with, for instance, radar. In the Stevns case the two 15cm twin-barrel guns were installed in 1955 from a German position in the west of Denmark. These guns were originally from the battleship *Gneisenau*.

After the English Channel daylight dash (Operation Cerberus) in 1942 *Gneisenau* went into dry-dock and was later hit by the RAF. Despite attempts to repair her, eventually all of her heavy artillery was taken and reused as coastal artillery. Two of the 15cm twin-turrets are now at Stevns, the rest were installed in Finland and at Den Helder, Holland.



*Elena at the controls of the 15cm twin barrelled gun at Stevns, originally built for the *Gneisenau*. The red and green correspond to port and starboard barrels, which could be controlled independently in elevation, but not in traverse. The separate cartridge and shell for the gun can be seen bottom left*

We were able to enter the turret from above and see the immense armament. The turret alone weighs 110 tonnes plus 10 tonnes each for the gun barrels. A crew of 36 would have operated each gun, including fifteen in the turret and the rest in fire control and feeding ammunition. The two gun barrels could be elevated independently and a trained crew could achieve 4 – 6 shots per minute. Passing a current radar head and an original periscope, it was time to take in the delights beneath ground.

We descended eighteen metres through the only entrance to the north and entered a network of tunnels frozen in time. At the bottom of a set of stairs was a





Plan of Stevns Fort. The white tracks are the surface anti-aircraft battery and the grey lines show underground passages. Underground rooms magazines, barracks etc are in brown. You can see the fort is effectively two separate batteries, with one linking corridor. The theory was that a single strike would never take out both gun positions

decontamination entrance alongside the normal way in. Near to the entrance was a firing control post for one of the guns which lay below the periscope on the surface. The two guns were positioned far enough apart so that it is unlikely both would be destroyed in a single strike. Beneath ground, everything was duplicated with the two sections separated by strong blast doors so that each half could operate independently.



Unlined tunnel within Stevns Fort; cut in chalk, a layer of flints can easily be discerned. The left foreground has coat hooks in situ, middle distance right is the tiled surround of a urinal

Nuclear-Hardened Shelter

The unlined tunnels housed a nuclear-hardened shelter for around 300 men who had supplies for three months: 80,000 litres of fuel for the machinery and an artesian well for water plus everything else that was needed for survival. The tunnels had been excavated by hand – drill and blast – and extended to over 1700 metres. Where side passages led off, dead-end alcoves had been excavated to prevent explosions in side passages propagating along the main tunnel.

Within the complex, groups of buildings were constructed in chambers but without the walls touching the natural rock. Firstly this helped minimise any damp penetration but more importantly it provided some protection against the subterranean shock waves associated with large bombs.

The site was run on naval lines and barrack rooms provided accommodation for 36 crew and ten petty officers. Washrooms were alongside but the main tunnel had occasional urinals simply built into the side wall. No women underground so no screening provided.



Shell store beneath the 15cm guns in Stevns Fort. The shell colour indicates its purpose (eg armour piercing, high explosive, practice etc)



Artillery calculator within the Artillery Control Centre at Stevns Fort. This mechanical computer took many variables including temperature, wind, pressure and so on and coupled with the visual or radar plot of a target calculated elevation and heading to deliver an accurate trajectory

We were able to visit the magazines and ammunition hoists beneath the gun which were somewhat reminiscent of France's Maginot Line forts. We visited the original Artillery Control Centre which housed an electro-mechanical computer for plotting target information and climatic conditions and calculating the adjustments needed to gun elevation and trajectory.

All was in an excellent state of preservation as the contents of the sites had been largely left in place when the military pulled out. Another room held the emergency generator which looked surprisingly small for such a large complex.



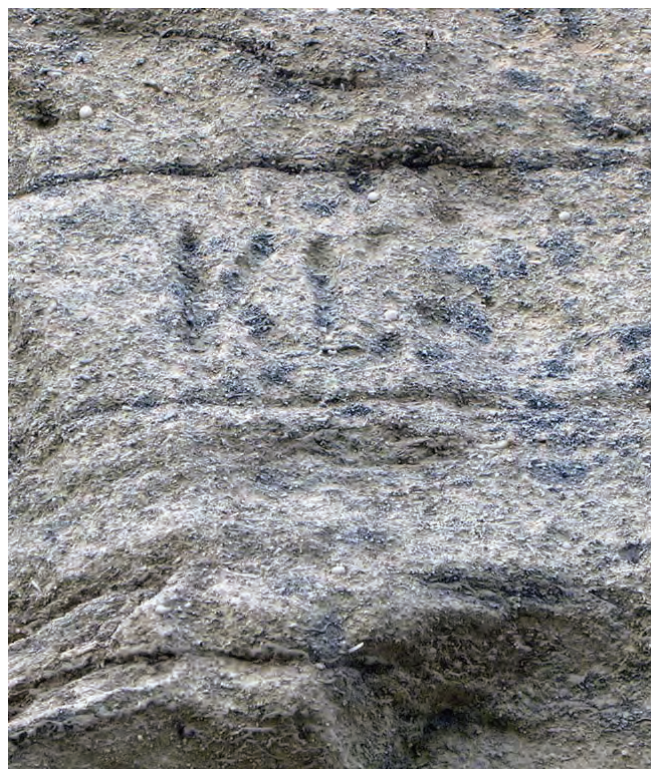
Generator within the Stevns Fort

Frozen in Time

From 1984 part of the complex had been used as a Radar and Communication Centre and this too looked like it was still in use. Original computers, radar screens, procedures and reference books all remained in situ from its closure in 2000. Even coffee cups and 'top shelf' magazines were still in place. In one of the rooms we were shown the physical relay box for the USA–Moscow private hotline dating from 1963. Part of the site had been a secret NATO Communications Centre and we were told that operatives were physically



Originally used for construction, this passage emerges into the open air and could have been used as a last-ditch emergency exit. The sentry post within was described as the most boring job in the Danish Navy



The initials 'KL' carved within the cliff face at Stevns by a member of the Soviet Special Forces on exercise.

Photo Martin Dixon

padlocked to their desks to prevent code books being taken off-site. All in all quite a remarkable scene and one that many of us were reluctant to leave.

One more surprise remained. We went along a side corridor and then magically out through an emergency exit to walk out onto the beach beneath the cliffs. There were two such emergency exits – one for each half of the fort – and they were originally used to remove spoil from the excavation.

We could see the deposition layers of the cliff towering above us although the K/T boundary itself at this point is beneath sea level. Jan pointed out some climbing pitons and the initials 'KL' carved well above us.

These were left by a member of the Soviet special forces on exercise – they clearly knew all about the fort and it was apparently the tradition for new recruits to 'prove their mettle' by leaving a reminder of their visit. We left no such calling card but departed suitably impressed with what is a magnificent Cold War site and a suitable climax to our brilliant weekend in and around Copenhagen.

As usual we owe thanks to all who helped organise the weekend, Linda, Lars and Tony, plus our local guides and site owners who without exception gave us such a warm welcome.

All photos by Clive Penfold unless otherwise acknowledged.

London's Underground Wells

Stewart Wild



*The original vault and spring at the Barnet Physic Well. This is now housed in a 1937 mock-Tudor building.
Photo Heritage of London Trust*

For geological reasons London has a vast number of natural underground watering holes, some going back to Celtic times. Many of these wells are 'sacred' and known as 'holy wells', with healing and therapeutic qualities ascribed to their (sometimes unpleasant) waters.

There are, or were, over two dozen wells in the London area, most of which may be located from place names. Camberwell, Clerkenwell, Sadler's Wells and Muswell Hill are four obvious candidates, while St Bride's Well (Fleet Street), Black Mary Well (Farringdon Road) and Lady Well (Lewisham) have all but disappeared in the modern era.

Further afield there are Chadwell Heath, Fulwell, Hanwell, Seething Wells (Surbiton), Shadwell, Stockwell, Well Hall, Willesden and Woodford Wells.

King's Cross Road was named Bagnigge Wells Road until around 1830 on account of the spring now beneath Cubitt Street, while Holywell Lane in Shoreditch gets its name from a long-lost well that probably dates back to Roman times or even earlier (the well was very close to the path of Ermine Street). It preserves the name of the Augustinian priory of Holywell (founded in 1152)



St Gonor's Well in Kensington Gardens. The site is now occupied by a drinking fountain with the inscription "This drinking fountain marks the site of an ancient spring, which in 1856 was named St Gonor's Well by the First Commissioner of Works later to become Lord Llandover. Saint Gonor, a sixth-century hermit, was the patron saint of a church in Llandover which had eight wells in its churchyard"

and is recorded as *Haliwellelane* in 1382. The well here is mentioned as *Fons Sacer* (holy well) in William FitzStephens' account of London in 1174.

Until a few years ago there was a pub in the Barbican called Crowder's Well, but that's now gone too*. And the chalybeate fountain dubbed Shepherd's Well in Well Road, Hampstead, dried up long ago. Caesar's Well is a spring near Caesar's Camp on Wimbledon Common while St Agnes Well still apparently flows under a pump house in Kensington Gardens.



Map showing position of the holy well, in Holywell Street, before the building of Aldwych

One holy well still exists, under Australia House in the Strand. Dating from pagan times, it gave its name to Holywell Street, a narrow and disreputable thoroughfare known for its bawdy taverns and dubious booksellers that ran east–west under what is now Bush House. This area was redeveloped in the first decade of the twentieth century, and the vast office building over the eastern end of the street is now Australia House.

I was recently privileged to attend a social occasion in a sub-basement bar of Australia House, and invited to view the top of the holy well that is now capped but still visible in an adjacent room some thirty feet below street level. During World War II the well is believed to have supplied fresh water to office workers when they used the sub-basement as an air-raid shelter.

My thanks to Dale Eaton and his colleagues of the Britain–Australia Society.

High Barnet's Physic Well

One practically unknown well, which may be inspected underground, thus justifying its appearance in this august publication, is north of London in the heights of Barnet, not far from Barnet Hospital in appropriately named Wellhouse Lane. It is known as the Physic Well, dates from earliest times and was popular as a medicinal spring in the seventeenth century.

Sadly it didn't become as popular as Bath or Leamington Spa, or Barnet today might look more like Tunbridge Wells. However it was worthy enough to deserve a visit from diarist Samuel Pepys who rode across Barnet Common to take the waters on 11 July 1664 and apparently drank five glasses.



Australia House well access with cover removed. Photo John Lill



Disused pump in Australia House used for water abstraction. Photo John Lill

Although he wrote that he was 'ill' on the way home, he returned with friends three years later (August 1667), at seven in the morning "to avoid the crowds". The party then repaired to the *Red Lyon* inn where they ate "cheese-cakes".

Decline and revival

Thirty years later that doughty traveller Celia Fiennes visited Barnet and reported that the well was not a clear bubbling spring but "an off-putting deep hole containing murky and very slow-flowing water". Despite this, local people continued to use the well and local landowner the Duke of Chandos was forced to back off when he tried to enclose that part of the Common in 1716.



Over the next century the well's decline continued despite a cover being built in 1808 to keep out leaves and other rubbish. This collapsed in 1840 and by 1876 the well was no more than a hand pump in the middle of a field.



The Witch's Hat. Photo Alan Swan

The Witch's Hat

Barnet Urban District Council began to take an interest in 1921 when the surrounding fields were surveyed to create a housing estate. By 1927 nearly two hundred council houses surrounded the well which was left marooned on half-an-acre of grass.

In the years that followed, the Council built a strange-looking mock-Tudor well-house over the spring that was soon dubbed the Witch's Hat and is still known as such by local children today. The well-house has a brick floor where a short staircase of twelve steps leads down about ten feet to the well itself, a stone-lined rectangular opening about six feet by three. I was told that the water level varies only slightly according to the weather and I did not taste the water.

For over sixty years the well under the Witch's Hat was locked and almost forgotten, and the building is now in a very poor condition. In 2015, however, Barnet Museum and Local History Society negotiated with Barnet Council



Clerks' Well. According to the historian John Stow, writing in 1603, the well, one of the several springs in the area, took its name from the annual gathering here of parish clerks to perform plays based on scripture and was therefore called Clerken Well; or Clerks' Well. Later the surrounding district came to be known by the same name. The well was rediscovered by workmen in 1924 and is now located inside an office block. It can be visited by appointment

to organise public openings of the well to raise public interest and funds for restoration. These take place monthly on Saturdays, 2pm–4pm.

With nearly one thousand visitors in 2016, and support from Barnet Council, Historic England and Heritage London, the future of this ancient underground amenity looks assured.

* The former *Crowder's Well* pub in the Barbican has recently reopened as *Wood Street Bar*.

Further information:

HERRMANN, Carla, *Barnet Physic Well*, Barnet Museum & Local History Society 2015, 8pp, ISBN 9781-910003-015.

For Physic Well opening dates 2017–2018: see www.barnetmuseum.co.uk

Sources:

Oxford Dictionary of London Place Names, A.D. Mills, OUP, 2001. www.davidfurlong.co.uk/holywellslond.htm

Abandoned mines in Oxfordshire

Stonesfield is a small place in Oxfordshire, about three miles west of Woodstock, famous amongst architectural historians and geologists as the location of mines, or underground quarries, from which 'stone slates' were dug for roofing buildings in the 17th to 19th centuries. The 'Stonesfield Slates' are not true metamorphic slates as are those of Cumbria or North Wales, but fissile sandy limestones. They were widely used in northwest Oxfordshire and also in some of the Oxford colleges. Like 'Horsham Slates' (also not slates, but fissile sandstones) they were thick and heavy, needing very strongly built oak beam roofs to support them. The mine shafts were a few yards deep, and the tunnels to which they led only from three to five feet high. All two dozen or so known

mines exploited a lens-shaped bed of stone extending about two miles from east to west, and one mile from north to south.

Unlike true metamorphic slate, the material was not split by hand. Large lumps of the stone of the right quality were mined from Michaelmas (29 September) to Christmas (25 December) and left in the open over the ensuing winter. Frosty weather resulted in the stone splitting to the required thickness. Craftsmen then trimmed the 'slates' to standard sizes, and bored a hole near the margin of each one for pegging to rafters.

SOURCE: MORGAN, Nina, 2014, Distant thunder: in the bleak midwinter. *Geoscientist* 24(11), page 25.



Here runneth further under

Sam Dawson



The heavily bayed and alcoved tunnel beneath the Wheatsheaf

In the previous edition of Subterranea, Sam Dawson explored some of the wells, tunnels, grottoes and bunkers beneath the Surrey town of Dorking. He concludes his excellent article by looking at the cellars beneath the hostleries

of the town.

Dorking always had a disproportionate number of inns, pubs and beer houses. Around forty or more in the 18th and 19th centuries, in startling proximity. Pubs with pubs opposite, pubs next door, pubs one door down. The explanation is its history as a coaching stop and a market town, whose hostleries offered entertainment, food, drink and beds to farmers selling and buying livestock – and also a place where those transactions could be done on the quiet away from the market and its duties on sales.

The market, or markets to be more exact (corn, cattle, poultry, general, even one selling snails at one point) created a need for convenient storage for wholesale and retail goods, as well as the food and drink necessary to service the appetites of those who bought and sold them. The soft rock was a gift. There wasn't a pub in the town that didn't have a substantial cellar below it.

Taverns in the Town

So it's not a surprise that the fifth largest known underground site in Dorking is below what was *The Wheatsheaf*, now *The Quilt Room*, at 37–39 High Street



The 16th-century former Wheatsheaf Inn





Former Wheatsheaf Inn, 37-39 High Street



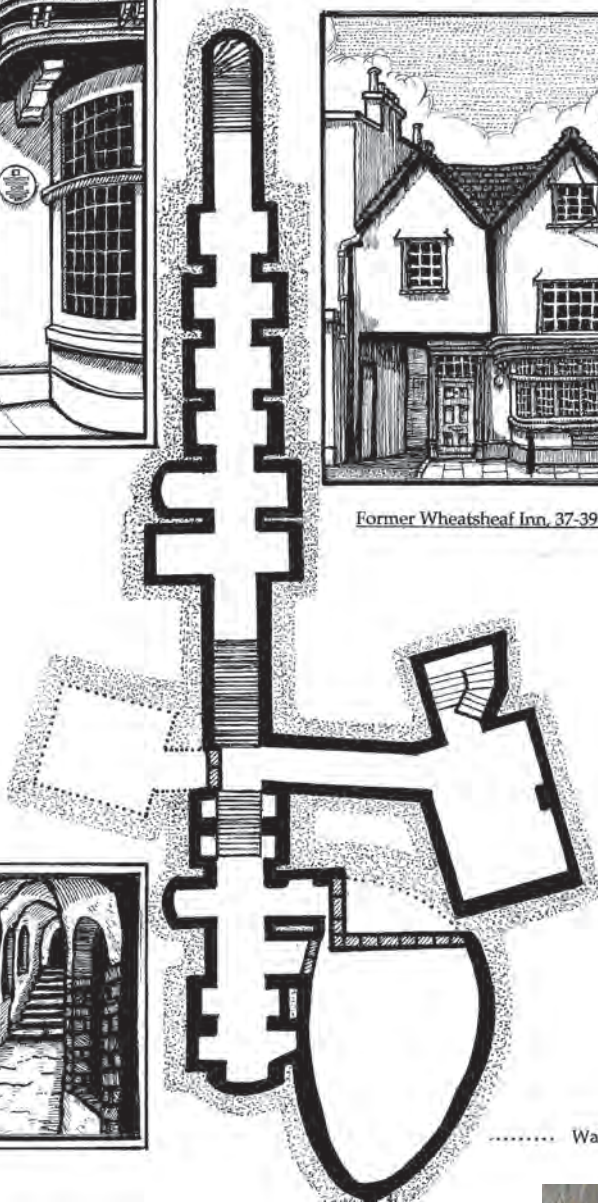
One of the tunnels two storeys below the Wheatsheaf

bays for holding bottles crudely and deeply gouged out of their sides, head in opposite directions. One towards the former yard, outhouses and stables. The other out under the High Street.

It's an atmospheric little labyrinth, with that instantly recognisable feel and smell of somewhere closed and very rarely visited. It also holds a rather dark little secret, a deep-buried arena where cockerels were set to fight to the death for the edification of spectators.

A Cock and Bull story?

That's not hyperbole; it is secretive. Cockfighting, bull- and bear-baiting were



(the fourth largest was below the long-demolished *Sun Inn*). Whether access can be achieved requires investigation.

Built in 1450, *The Wheatsheaf* was a landmark inn, a genuine mediaeval survivor. Only closed as licensed premises in the 1970s, it was then strengthened and conserved, a little treasure whose frontage enriches the High Street, a stubby white molar flanked by the incisors of its higher, squarer, Victorian-facaded neighbours.

It's built on several levels, up creaking steps and over wooden floors. And below them too. A small door in the one-time public bar descends to a roomy cellar, plus its closed sister basement, now walled up (though visible through airbricks), presumably for structural reasons as part of that efficient 1970s restoration

But there's a layer below that. A deeper one, and even then sloping slightly downwards. Two tunnels branch away from each other, each with its own steep and partially decayed staircase (one with 27 narrow steps, the other with 13 wider ones). These corridors, both with multiple



Stairs and bays below the former Wheatsheaf Inn



One of many bays for holding bottles

outlawed by the 1835 Cruelty to Animals Act, so it would be reasonable to assume that this cockpit dates from well before then. Logic says it would have been a public area, an asset to the pub that would draw in customers.

Yet it's not where you'd expect it: behind the premises, or just below them. Instead, those wishing to enter had to stoop through two small doors, descend two flights of stairs, slip into what appears to be just another wine bin and then squeeze in (the entrance is even more concealed now, as a modern structural wall narrows it and sits on top of the one-time sandstone benches). At this point the pub below is practically as deep as the one above is high. It feels hidden. It feels furtive.



Standing where once there was a wooden staircase, and looking up to a ventilation hole and one-time goods entrance

We know from the brilliant reforming Victorian journalist Henry Mayhew that clandestine blood sports continued in pubs after the Act. "(Dog) fights take place on the sly – the tap-room or back-yard of a beershop," he wrote, "the police being carefully kept from the spot". But what really rushed in to fill the gap was the sordid but then legal practice of rat fighting: setting dogs to kill scores of rats within a minute.

Mayhew counted forty or more taverns in the capital offering the spectacle. He described a typical rat pit in his 1851 book *London Labour and the London Poor* as being "a small circus, some feet in diameter ... fitted with a high wooden rim that reaches to elbow height. Over it the branches of a gas lamp are arranged, which light up the white painted floor, and every part of the little arena



Passageway on the cockpit side of the Wheatsheaf tunnels

... the audience generally clambered upon the tables and forms, or hung over the sides of the pit itself."

So was this Dorking cockpit a public facility abandoned in or before 1835 or was it, as Chelsea Speleological Society suspected, hidden and illegal? There is no obvious physical evidence. Just the fallen beams that once held the banks of seating, now turned cardboard-light by the damp: still formidable from the outside, and inside as crumbling as the sand that lies deep on the arena floor. A niche in the wall might have held a trophy. Or an oil lamp. But if so its wick was always well trimmed, there is no soot there. Or anywhere else evident. Possibly gas, which arrived in the town in 1834, was used. Oddly, or maybe suspiciously, no customers seem to have left their names in the easily-carved walls. What graffiti there is dates from the early twentieth century.

Pitch black, empty, it is difficult now to imagine this as a place of entertainment: dark and loud and raucous, thick with the fug of pipes and sweat and wet with the slops of beer and cider. What is certain is that below the shop there remain these two hand-carved tunnels as a reminder of the town as it was centuries ago. They're all the more interesting for being so little visited; not forgotten, but not now opened to the light. Unusable as a modern workplace for health and safety reasons, they are unvisitable by general public tour without the installation of handrails and new stairs and everything that might spoil their character. Being shut away has preserved them.



The cockpit



Cockpit, with remains of bench and wooden seating at left



Decayed remains of the spectators' wooden seating

The Surrey Mirror Reflects

There is a curious little postscript to the cellars' history. On 13 September 1884, the *Surrey Mirror* reported that "The Surveyor drew the attention of the Board to the existence of a cave beneath the High Street from which sand was continually being abstracted and suggested that measures be taken to prevent it so as to secure the safety of the public over the thoroughfare in front of the Wheatsheaf Inn."

Did the inn's owner have a right to undermine the highway, the Board asked, to which the answer was that it was "generally understood that they claimed half way of the road". Faced with this surprising assertion, the board decided it was unable to take any action beyond warning the owner that he would be liable if anything happened. The surveyor noted that there was 15 feet of earth between the cave's ceilings and the road's foundations, but he "should not like to trust traction engines going over it".

Was the digging to increase the storage space, expand a covert amphitheatre, or just to extract sand for profit or use? The sand in the cockpit is noticeably fine, finer than that taken from many of the town's quarries. Certainly as good as that sold at the time as a floor covering for pubs, a hygienic way of soaking up the slops and spit and mud that didn't, like the alternative straw or sawdust, also harbour rats, mice, mites and more. Its ability to soak up blood and fowl flesh would already have been demonstrated within the inn's premises.

The incident reveals a curious facet of local history, a folk belief that owners could freely dig to a halfway point under the town's main roads. And several did. A tunnel, now closed, reportedly crossed beneath narrow little West Street, from number 9–10, the former *Rose and Crown* pub (now *Christique Antiques*) to number 55 (now *Viva* restaurant).

Tunnel of Love?

The story is that it stretched from the tavern to a brothel opposite, allowing its customers to establish the alibi of an innocent pub visit. Sadly, so far no hard evidence for this has been found. It seems unlikely that the police, who closely monitored – and when necessary cracked heads in – the town's pubs, would be unaware of a regular promenade of prostitution literally beneath their noses. It's a good story though. There may have been an illicit purpose, such as for the passage for occasional shipments of untaxed liquor, or this might be another example of a pub needing more cellar space.

Cooperation in sharing cellars was not unusual in the town. Whichever it was, it is another example of a relic of old Dorking and its legion of lost hostelries – of which the *Rose and Crown* was, by repute, very much one of the humbler ones. Both a pub and (packed) common lodging house, it had been converted from two sixteenth-century cottages, with stabling for just two horses and cramped accommodation. According to 1890s records its customers were vagrants and "a low-class of people". This being Dorking it was just yards from yet another inn opposite, *The Bell*, itself next door to the tunnel-connected number 55.



Christique Antiques, formerly the Rose and Crown and once connected to the building opposite (now Viva), next to which is the former Bell tavern, yet another of Dorking's multitude of coaching inns

Beneath the Streets

These aren't the only conjoined cellars. Those of the *White Hart* on Dene Street were said to be linked with a competing pub, the *Surrey Yeoman* on East (now High) Street until a reported collapse in the 1970s. There are several other examples. Some must have been planned, others may have arisen from the accidental driving through into a neighbour's cave, at which point the two

parties seem to generally have either walled up the gap, agreed a common use, or sealed one entrance and given the dual cave over to a single owner. In 1880 the *Mid Surrey Mirror* noted that the town was “intersected by numerous deep and winding caves”.

JS Bright, in his historically valuable 1876 book *Dorking, a History of the Town*, notes that the many sand caves in the town “are large and convenient for the storage of wine, beer, and other articles of consumption. They extend, in some cases under the public streets, and run far back into the hilly sides of the town” (emphasis added). The joining of tunnels, particularly below the public highways, might have assisted loading and unloading and moving goods from storage to stall at busy times such as market and processional days, as well as providing protection from the weather and eliminating the need to cross the town’s notoriously muddy main roads.

Avoid Like the Plague

In the village of Dunster in Somerset one long terrace of houses had doors added between each premises during a seventeenth-century plague epidemic so that their length could be walked without stepping into the street. It’s not inconceivable that something similar happened here (even if the greater danger might have been the day-long, town-wide affray of the town’s football match).

On the subject of epidemics of pestilence, Bright noted that “the visitation of the plague was felt frequently in Dorking”, with 108 deaths in 1603 alone, many “buried in their houses or neighbouring fields”. There may be some surprises awaiting those carrying out building work. In recent decades potholes in two town-centre roads have been filled, then reappeared and been refilled, suggesting the existence of further possible voids below the tarmac. The former bakery at Pump Corner reportedly had a cellar room full of ovens that stretched out under the road which was simply bricked off when newer ones were installed in the nineteenth century; however, given the width of the pavement it’s more likely that if the space does remain it is beneath the footpath.



Pump Corner; junction of the town’s original four main streets and site of the town pump (centre), as well as its forgotten ancient well

In searching for confirmation I found a slab of stone with a small squared keyhole in it, a few metres from the pump that replaced the ancient town well. Just discernible, unnoticed and worn by centuries of feet, is a message carved in it to advise future generations of what it covers. Rather thrillingly, once deciphered, it reads “Well”.



Talbot House



Talbot House cellar. Now elegantly lit and furnished with antiques for sale, it was once a smoke-filled, naturally blacked-out part of a wartime jazz underworld



The cellars of the former elegant double townhouse, with the apparent arched passage, really a fuel store, in the background

The finding of an apparent tunnel for mining building sand reported in *Subterranea* 40 (December 2015, page 6) also raises the possibility that there might have been

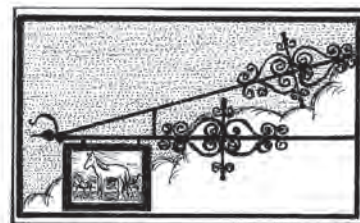
people prepared to do a bit of covert digging for profit at a time when the usual and easy method of extraction was large-scale surface quarrying.

Appearances can be deceptive, though, as evidenced by the legend of a tunnel to the parish church from the *White Horse*, whose genesis was probably the well passage. The enviably roomy antique cellars of seventeenth-century, Georgian-fronted Talbot House at 51–52 West Street, home to a servicemen and women’s jazz club in World War II, feature what looks very much like a closed-off tunnel reaching out under the road. Entered, it reveals a small aperture up to an iron cover in the pavement above that confirms it as a one-time coal or wood repository.

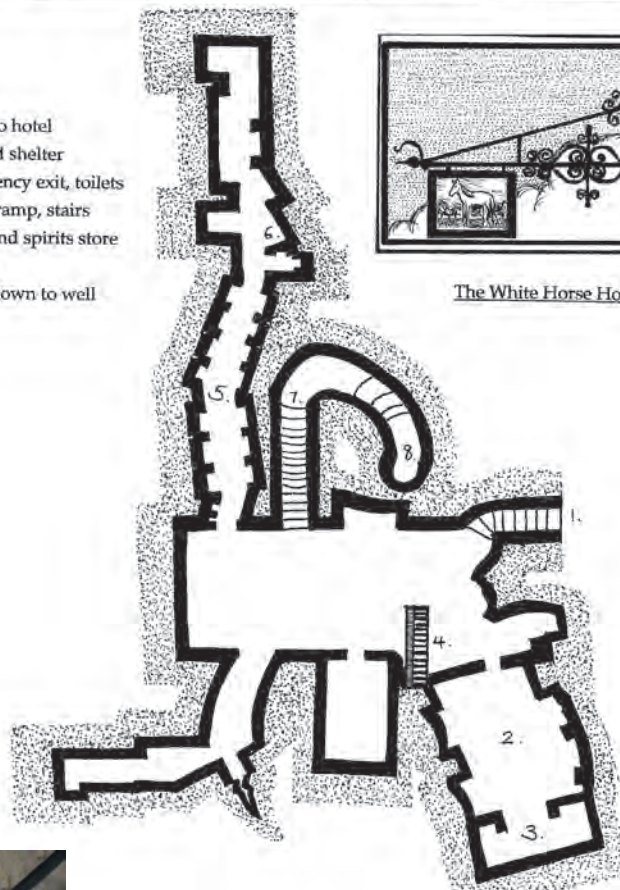
It’s worth remembering the caution voiced by Surrey historian Mathew Alexander: “It is not unlikely that many of these rumours (of lost or sealed tunnels) are started by wine bins. These are alcoves built into the walls of many Georgian and Victorian cellars. They often take the form of a shallow, arched tunnel leading off the cellar, and often are only a few feet deep with a rear wall of brick. It is easy to see how these could give the impression of a blocked-off tunnel.”



1. Stairs to hotel
2. Air raid shelter
3. Emergency exit, toilets
4. Barrel ramp, stairs
5. Wine and spirits store
6. Range
7. Stairs down to well
8. Well



The White Horse Hotel



The deceptive bay

Hostel to Hostelry

Another one-time coaching inn with unique historical cellars is the *White Horse Hotel*. This has been a feature of the High Street since its construction in front of and on top of an older edifice, the twelfth-century Cross House, named for its ownership (and possibly use as a hostel) by the monks of war, the Knights Templar and, after their violent suppression, by the Order of St John of Jerusalem. That earlier building featured in two incidents

of bloody history, the murder of a chaplain there in 1241, and a 1520 attack by an armed mob on the servant of its then occupant, vicar Miles Hogg.



A town landmark, the White Horse Hotel conceals a small labyrinth of tunnels beneath it

The Cross House was replaced in the eighteenth century by *The White Horse*, now a town landmark, which incorporated the older structure’s foundations and probably some of its masonry.



The first of the White Horse cellars

What is below it is, at first sight, slightly fantastic, far more extensive than expected. A fairly normal pub cellar, girder- and brick-roofed, stone- and brick-flagged, gives off onto unsuspected tunnels and rooms, mostly still in use, many with walls of burgeoning, bulging bulwarks of sandstone buttressed by columns of bricks. This is organic growth; reused, modernised, adapted, only sometimes here and there left to decay.



Unusually for a Dorking inn all the wine bays are neatly finished in brick



Barred gate to bayed and alcoved bottle store – and considerably more tunnel space than initially appears

There's a very modern barrel room; an original multi-bayed wine and spirits store that stretches much further than you expect it to, into a crudely niched turn that might even predate the building above, and then into another tunnel now used for document storage, with an incongruously plinth-perched antique cooking



Beyond the wine bay there is a further tunnel, with an antique range looking oddly out of place in it

hearth marooned there. One large, unused, crumbling, sandstone-walled room reveals the traces of a probable air-raid shelter for guests and staff. At its far end there is a small annexe room with a ventilation pipe, emergency exit and a heavily cobwebbed cubicle either side that would fit a chemical toilet.



The entrance to the suspected air-raid shelter is squeezed between a bulging sandstone wall and a barrel ramp and staircase

And when you think it can't get much better, you remove a panel blocking off a doorway and instead of revealing another chamber it is worn stone steps down that face you.



Inside the air-raid shelter



In the roof of the shelter there is an escape hatch

The sand floor tilts down, the tunnel turns, there are four more dais-like steps, and at its end is the bottom of a well.

Chthonic Irrigation

It's not so usual to be able to look up a well rather than down into it. So, which came first? A surface well, nicely placed to serve the kitchens and extensive stabling and accommodation up top? Or the passage down to the spring that was its bottom? Was it thought easier to drive a tunnel to an existing wellshaft in order to draw water by hand, then climb two flights of stairs to the kitchens instead of cranking it to the surface right by the kitchen door? If so it's difficult to explain why the passage performs an improbable loop before reaching its objective. Or was the shaft dropped onto an existing cellared spring beneath the inn? We don't know. And aren't likely to.

The passage down to the well shows a tidemark up to the second step, revealing a less disastrous rise and escape of water than in the South Street Caves. A quick fingertip search of the loose sand that fills it immediately turns up fragments of china and nineteenth-century bottles. The entire tunnel is wonderfully marked by its users. Here again are the superb carvings of barely educated potboys, cellarmen and servants who, at a time of widespread illiteracy, nevertheless left us their names in the fine cursive script that would have been thrashed into them in the short period of basic schooling allotted to them. Here are dates: 1761, 1793, the beginning of the French

Revolutionary Wars; 1801, 1811, 1818, the year of *Frankenstein's* publication; 1819, October 1822, 1889 – a plethora of remembering, history, names and initials. Etched by hand down here in the near absolute darkness in moments of rest or escape by staff sent to lug water up all those stairs: W Baker, C Clack, Woollett, Jones, Ann Hewett.



Stairs down from the cellar to the well passage



The passage descending to the well is heavily carved with the names of those who used it

Was one of these a serving girl or barman who took Charles Dickens his water and brandy or hot rum and butter, or served him and ten thousand others the local delicacies: water sousey (a dish of carp, perch and tench), white snails, a Dorking chicken with its characteristic supernumerary claws? They laboured, lived, perhaps



Two storeys below the surface, the White Horse well, surrounded by the carved names and initials of those who drew water there. An 'I+P' appears both here and the South Street caves. Perhaps the same person worked in – or delivered barrels/bottles to – both establishments

loved here, and nothing would remain of them if they had not left us their handiwork in these walls.



Looking up the well

Inns and Outs

With the coming of the railways and the ending of stagecoach routes the number of inns fell, and continued to do so as the farmers' market declined throughout the twentieth century. Among the evocatively named losses were *The Pig in String*, *Great Bell Inn*, *Cardinal's Hat*, *Three Tuns*, *Ram*, *Rock*, *Gun*, *Sun*, *Fox*, *Nag's Head*, *Evening Star*, *Beehive* and *Red Lion* (from whose steps the Riot Act was read in 1830, before the cavalry were let loose upon a crowd of protesting agricultural labourers chanting "Blood or Bread"). But the town still supports some fine examples of historic pubs. Of the lost ones, some buildings remain in retail or business use, potentially with their underground areas intact.



Numbers 5 and 13 High Street flank the former carriage entrance to the historic King's Head inn

Even a comparatively simple cellar conceals clues. Number 13 High Street (Shoerite Limited) is a Victorian shop and residence above, with a basement, constrained by the building's footprint, below. Apparently. Except that even in this humble storage area there are two arches, one now breeze-blocked, that scooped out extra space by stretching under the carriage entrance of the neighbouring inn, the *King's Head*.

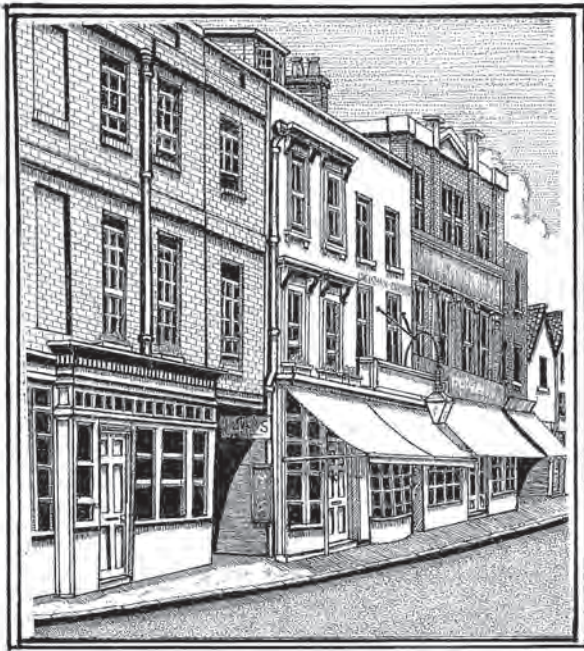
Decapitated brick columns show different periods of construction and that the shop floor has been lowered (removing the entry step necessary in the days of earth and flint roads) at the basement's expense. In the cellar wall there are the remains of a small, blocked window that would once have given onto a skylight or grated airhole in the pavement. No trace of it now remains above, and the brickwork is older than the smart Victorian stucco frontage would suggest.

The same goes for the four steps up to an antique blocked doorway that must once have given onto the street – from where both entrances to the space below have been firmly erased from view. But only on the surface. What lies beneath reveals that what lies above is more ancient than its façade suggests.



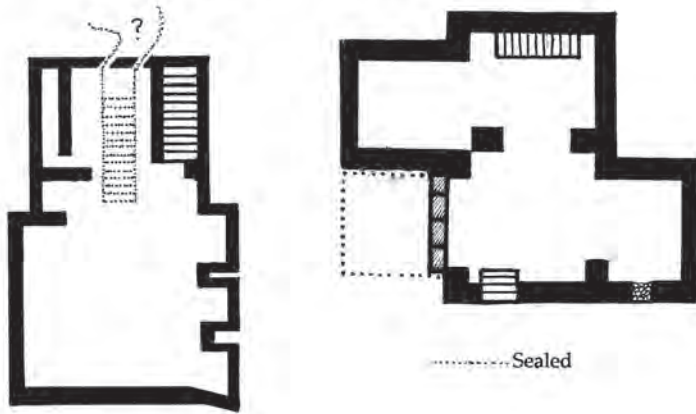
Number 13: one of two arched cellar sections directly below the King's Head's former carriage entrance

Its neighbour is even more interesting. Just the other side of that narrow drive into the old inn yard is number 5 High Street (Dorking Alterations). Which houses an entrance into the ancient hostelry's cellars. Or one of them.



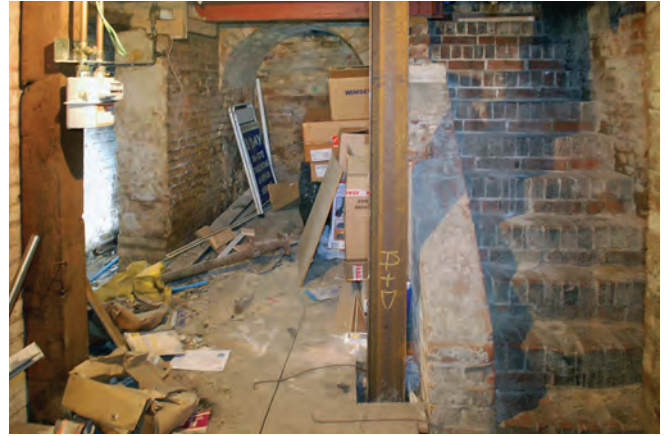
Number 5 High Street

Number 13



The *King's Head* was an early and leading inn, dating back to the late seventeenth century (and even before that as the *Lower Chequers* tavern; the rival *Chequers Inn* was across the road), and was for many years a leading transit point for anyone wishing to travel by stage to London. It was the likely original for the *Pickwick Papers'* *Marquis of Granby*, while Sam Weller's father was probably modelled on the coachman of the *Bull's Head*, almost opposite.

This is how Dickens described it: "The bar window displayed a choice collection of geranium plants, and a well-dusted row of spirit phials. The open shutters bore a variety of golden inscriptions, eulogistic of good beds and neat wines; and the choice group of countrymen and hostlers lounging about the stable-door and horse-trough, afforded presumptive proof of the excellent quality of the ale and spirits which were sold within. Sam Weller paused, when he dismounted from the coach, to note all these little indications of a thriving business, with the eye of an experienced traveller; and having done so, stepped in at once, highly satisfied with everything he had observed."



The cellar below Number 5, part of the old *King's Head*. The wooden flooring to the left of the stairs conceals a further cellar. The author of the 1855 *A Hand-Book of Dorking* wrote that "The accommodations of this vast establishment were once on the completest scale; and at that period it was noted for serving up *water-sousey*, a delicate fish, in great repute among the bon-vivants." Later, despite the building of a large entertainment hall, "it declined and the premises were let off and converted into shops and partly occupied by poor families."

The inn retrenched. It had straddled two important roads. Now parts were sold off, in particular its sizeable presence on the High Street. Then the courtyard, vital for the stagecoach trade and long a venue for visiting players, went. The part of the building facing onto narrow little North Street remained virtually unaltered, much of it surviving as an inn into the twentieth century.

In time the ex-premises on the High Street were remodelled and acquired an early Victorian façade. They got a second one, with Dutch gables, towards the end of that century. The old courtyard and North Street frontage, (which faced, just feet away, yet another competitor, the *Gun Inn*) have all now been charmingly preserved as a café and small shops.

Hidden Steps

Entered, like its neighbour at Number 13, through a hatch in the shop floor, the cellar at Number 5 is a fine one, which reveals its evolution through different eras of brickwork, arches and some surviving antique beams. Typically, it has four alcoves built into the walls for holding bottles. An intriguing short, narrow little apparent corridor leads off on one side, complete with a niche that might have held a lamp, and a curving roof that suggests how the space has changed over the years – and that more of it may have been filled or sealed off behind the existing walls during the generations of changes.

Unusually, it is completely lined with brick, including the floor. Except, that is, where that floor is made of timber panels. An arrangement that seems quite normal until you notice gaps at the edges. Explore these, lie down, squeeze a camera in and you discover that there are 13 more brick steps, well-walled and arched above,



There are hints that there may be further cellars behind the walls of the much subdivided one-time tavern

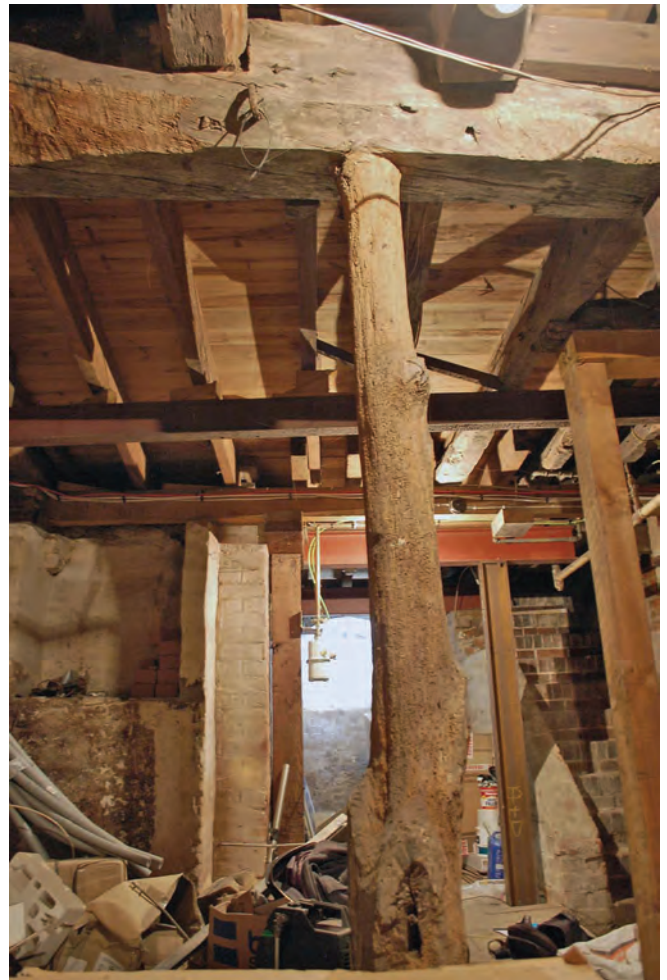
leading into an intriguingly dark sand cave below. This has been drawn to the attention of the owner and it is at his discretion to decide if at some point a panel can be lifted (and later replaced) to allow a way in.



Shot through a crack in the cellar floor at number 5: stairs down to a further level

Three in a Row

The weakest stone thrower could once have hit five taverns from this one's doorway. One was the *White Lion* (now the St Catherine's Hospice Shop) at 8–10 South Street. It is uncertain whether this fine little (probably) seventeenth-century historical building was built as an inn, or was, like many others, converted from a dwelling.

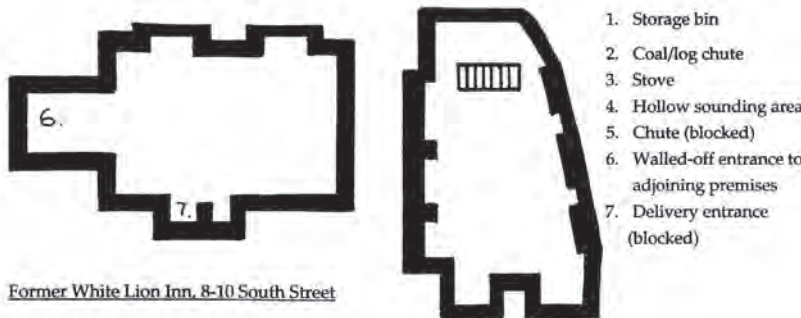
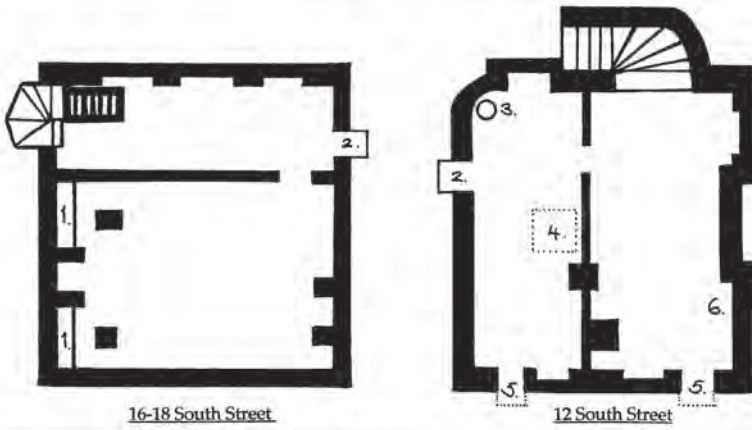


Original timbers from the days of the old inn

The original basement, now divided into two, appears small if intended for pub use. A shortcoming that looks to have been solved by buying the neighbouring building, Number 12 (now The Edit), and driving a passage through into its cellar rather than out under the road. This would have offered the additional advantage of an entrance direct into the shared inn yard and stables area behind both buildings.

Charles Rose described the *White Lion* as being “besieged” on Saturday nights by workers from the chalk pits eager “to attend that welcome spot – the pay table”. This blameless (if you set aside the rather odd presence of peepholes in its bedroom doors) little inn was closed by the licensing authorities in Edwardian times as surplus to the town's requirements, then divided into two shops. Its cellar was likewise split into two, both now part-filled with earth, and the way through to Number 12's basement sealed off.

Over the years the former pub has hosted various concerns: a cobblers, dyers and cleaners, clothes shops, and a tailors; owner Ian Cameron, co-author of both buildings' award-winning 1990s restoration, reports finding a wealth of lost cotton reels, wooden soldiers and thimbles beneath the floorboards. Meanwhile Number 12 was, from 1893 to 1958, a tobacconist and confectioners named Boorers and, later, Ye Old Oake Shop.



1. Storage bin
2. Coal/log chute
3. Stove
4. Hollow sounding area
5. Chute (blocked)
6. Walled-off entrance to adjoining premises
7. Delivery entrance (blocked)

Former White Lion Inn, 8-10 South Street



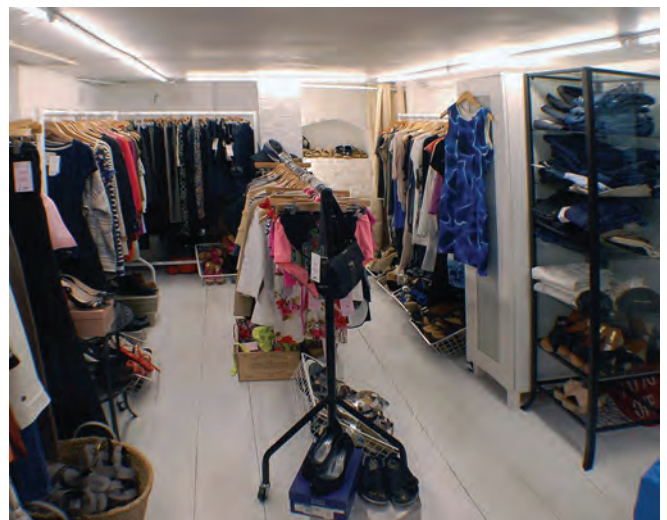
Coal stove preserved in situ below Number 12 South Street

There is a lovely description of it as it was in 1920 written by one of the family, Elizabeth Green, née Boorer: "The shop was small and dark. You went down two steps to go in and from the door the floor sloped away unevenly,

down towards the counter at the back. Coming in from the sunlit street, you felt you were entering a cave. Perfumes met you as you went in, snuff, cigars, tobacco, chocolate and, over all, a certain stale mustiness. The ceiling was beamed with old ship's timbers and the whole place was very old. A warm greeting from my aunt and uncle; the counter flap lifted up and I would be in the Holy of Holies, behind. In the entrance door there was a small counter inserted and arrayed under it were boxes of all kinds of sweet things. I remember locust beans – hard and brown and sweet, probably somewhat dusty, too – chocolate drops, aniseed balls, sherbet and black licorice, not yet surrounded with colour ... a halfpenny bought a feast."

Number 12's cellar, with its old coal stove preserved in situ, remains in use, part shop floor, part storeroom. Like many in the town, the chute or trapdoored entrances down from the street have been paved over without trace, but a fine coal hole cover, a ringed square slab of stone far from the elegant cast-iron ones of the later Victorian era, lives on in the alley above.

Ian Cameron describes the urgency of flooring this cellar as part of the restoration. At some point its original



The cellars at Number 12, with characteristic alcove in far wall, once belonged to the neighbouring White Lion pub

sandstone floor had been given a thin screed, probably to allow the tobacconists' goods to be better stored there. He says that he will always regret the need to concrete over an intriguingly hollow-sounding patch that may have covered a further cave, or possibly a well, below.





The conserved (thanks to the enthusiasm of its owner), part-filled, left-hand cellar of the old White Lion, showing at the far end the passage built to connect with the building next door

Next door, the left-hand side of the divided pub cellar lives on in earthy darkness, living history unsuspected beneath the customers' feet. Blackened and heavily cobwebbed, the right-hand half is a kind of museum to shop use, heaped with the jetsam of recent decades. Mounds of plastic clothes hangers crackling underfoot testify to a decision to replace them with wooden ones. A child mannequin remains forever young next to a discarded 1980s cash register. Nearby among the detritus of old fittings, another register is slowly sinking into the soil.



Storage bays and the trap down from the shop, formerly the White Lion, above

Time and Tide

The tides of time and history wash over our surroundings, covering them or washing them away. But sometimes unearthing them too. Just next to Number 12 and the former *White Lion* is the early nineteenth-century Number 16–18 (Shabby Chic Country Living).

A recent renovation here removed the previous fittings and modern flooring to reveal fine old floorboards and a pub-like double hatch down. Once it would have led to a roomy brick- and stone-lined cellar which can now be entered from behind the shop. In it the original alcoves live on, alongside large brick storage bins very similar to those at the *White Horse*. In the alleyway above another hand-carved ringed stone slab covers the coal chute that once fed into it.



16-18 South Street



Coal/log chute seen from above. A similar hand-carved, ringed stone cover also serves number 12, next door



Brick-built storage bays which are very similar to those at the White Horse inn



View of the roomy cellars below number 16-18.
The far wall is given over to storage bays

Journeys to the Underworld

Despite Dorking's superabundance of pubs, its beery cockfighting and cheery riots, alleged witches, hanged highwaymen and naughty boys (who disassembled a bridge behind a funeral procession and blew up a Box Hill cave drinking den), its exhibitionists and eccentrics, underground sects and subterranean sex, tunnellers and tarts, it still somehow failed to make it into the county rhyme:

“Sutton for mutton,
Carshalton for beeves,
Epsom for whores,
and Ewell for thieves.”

By living even a few generations we become time travellers, suddenly wondering when we stopped answering telephones by stating their number or when shopkeepers ceased counting out change into your hand. We remember the past, but evolve in a succession of presents. Subterranean structures – made redundant by refrigeration and regulations on food and drink storage, then closed off as too dark or dank or dangerous – don't. The town's hand-dug, often crudely made, sometimes dripping cellars are perfect time capsules. Unchanged, they take us back to a Dorking of Swing Riots and arson by farmworkers barely surviving on starvation wages, of invasion scares, yeomanries and militias, disease, poverty and public execution, and of dread of a poorhouse that was so large that when it was converted for a twentieth-century hospital two thirds of it was demolished – yet when the area was also a ferment of the arts, an inspiration for artists and authors.

And all overlooked from a scenic distance by the mansions of men unsurprised by the idea of spending the equivalent of 750 years of a farm labourer's annual wage to memorialise the fraternal gift of a garden extension.

Lost But Not Forgotten, Forgotten But Not Lost

Over the years some major subterranean structures have been destroyed, but there's enough, known and unknown, below the town to reward months of study, whether lost but not forgotten or forgotten but not lost.

Prime in the first category is the site of the town's leading industry and once most famous product: Dorking Lime. As in many places the road names give away what has now been completely filled in and built over: Chalkpit Lane, Limeway, Chalkpit Terrace. Alongside and beneath them once stretched a huge quarry and towering lime kilns, even, during the war, an anti-tank ditch stretching to the slopes of Box Hill. It was an enormous operation that only closed in the 1940s.

The 1855 *A Hand-Book of Dorking* noted: “Dorking is especially famous for its Lime and for its Fowls. In the Chalk Pits ... are several large kilns. The lime produced here is much valued for its property of hardening under water, and it is said to have been first extensively used in the metropolis, in building the London Docks, and the Sessions House and County Gaol at Horsemonger Square.” (As well as the Bank of England [1788 onwards], Somerset House [1801] and West India Docks [1802].)

It was considered the best in the country, according to JS Bright who wrote in 1872 that its quality “created many years ago an excitement which was called the lime mania”. It became so famous that two rival works were built at nearby Betchworth, both trading on the Dorking name.

But it was the town's quarry and works that took onlookers' breath away. They almost deprived the Victoriantly verbose author of *A Picturesque Promenade around Dorking* of words to describe them. Breathlessly he talks of “Tremendous precipices and chalk-pits which are continually wrought (and) immense kilns,” and says that they were “by far the most extensive” of the competing concerns. If so, they must have been truly spectacular; the by inference smaller, but thankfully remaining works at Betchworth are still a treasure trove of industrial archaeology.

The two quarries there (one known as Brockham Lime Works) are definitely worth visiting. Betchworth Chalkpits, now a nature reserve, has lost its once vast cliff (over which a white Jaguar was filmed driving to its death for the TV series *The Saint*, the footage recurring in successive ITC programmes) to landfill and many buildings have necessarily been demolished.

But many superb built artefacts remain, and some of the destroyed ones were captured in the 1970 film *Scream and Scream Again*, which used its other-worldly scale and everywhere-white-coated scenery to considerable effect. The same is true of both sites' appearances in the 1976 Doctor Who series *The Deadly Assassin*. Sadly, *Lloyd of the C.I.D.*, a 1930s cinema serial filmed at Deepdene House, is currently listed as lost by the British Film Institute.

Heavy Metal

There are many other lost or unenterable sites recorded in records, or discoverable when exploring: the apparently deliberately collapsed bunker that looked out over the



intricate pattern of trenches dug in The Nower's woods for pre-D-Day training; Cotmandene Cottage's "garden grotto and cabinet collection of curiosities" mentioned in *A Picturesque Promenade*; at least two venerable cellars below Waitrose in South Street, one of them surveyed in 1940 for use as a public shelter; Deepdene's ice-houses and tunnels, an underground site of national importance; and the once highly modern staff shelter now resting beneath the croquet lawn of Milton Court, built when the mansion served as the wartime headquarters of Henley Cable.



The practice trenches whose was observed from the bunker

Then there's the bomb shelter of Powell Corderoy school, buried below Wickes in the old quarries of Vincent Lane, where composer Vaughan Williams filled sandbags in World War II in between visits to Dorking Halls, built to stage his music festival, and itself sited in yet another former sand quarry; and the demolished 1892 mobilisation centre on Denbies hillside (site of the fictional 1871 *Battle of Dorking*), whose sister redoubt on Box Hill has had its underground magazines barred off for bats by the National Trust. (Also buried at Denbies were three armoured vehicles jettisoned in 1944. Two have now been recovered, including a Covenanter tank, disinterred in 1983 that now, superbly restored, graces Bovington Tank Museum.)



Part of the trench complex, a practice climbing wall

A member of the Surrey Antique Bottle Collectors' club owns three Bellarmine jugs, 16th- or 17th-century pottery flagons, bought still wrapped in pages from a 1950s *Dorking Advertiser*. That was when the seller, a builder,

had been working at Number 99 High Street, and come upon a "cellar full of them". Mildly interested, he picked up the specimens that he would sell years later. Now worth not too far off five hundred pounds each, there should be scores or maybe hundreds more still down there. With a Barclays Bank built on top.

A sad but probably unavoidable loss were the caves filled in during the 1970s construction of Sainsbury's car park behind the High Street. A myth exists about these and their claimed sudden and dramatic destruction, including of their amateurishly mural-painted walls, which are described as being of possible Roman origin, despite their looking very 1960s Tolkienesque.

A check of the records shows that the council surveyed the caves – in reality a cellar complex shared between two shops several premises apart (that cooperation again) and a tunnel (shared by two widely spaced shops) – ahead of the decision to demolish, and retained the short sections not below the car park. Permission is being sought to visit. In the nineteenth century the premises had belonged, among others, to the *Chequers Inn* (whose splendid double bow-front, along with some 16th- and 17th-century wall paintings, is preserved as Robert Dyas), and to Sauberge's, a once celebrated ironmongery, behind which the goods for sale were manufactured by a thirty-strong workforce of blacksmiths, whitesmiths, gunsmiths, coppersmiths and braziers. The cellars would have been perfect not just for the storage of goods, but also of the necessary coal and coke. This would also appear to be the site referred to by the local newspaper in 1940, when it reported that "Terms suggested ... having been accepted, the air-conditioning plant is to be adapted to serve the public basement shelter below those premises."

Prior to the laying of the car park surface the cellars were exposed to the air and photographed. Using this record the British Brick Society has kindly provided the following information about the walls shown, both painted and unpainted: "The half-brick thick separating wall with piers that abuts the mural looks very much like a wall of London Brick Co 'Fletton' bricks from their relatively precise form and their colouration. Looking at the top of the wall, they seem to have the deep frogs typical of 'Flettons'. If that identification is correct it would corroborate a 1960s/70s date."

Alongside an unlined sandstone cellar dug from above, the other easiest way to make excavation is a simple horizontal shaft driven, sometimes very deeply, into the hillsides or the numerous cliffs created by quarrying throughout the town. (These stretch virtually the whole south side of the High Street and much of South Street and Vincent Lane).

One of these tunnels, whose entrance was pictured in an attractive 1905 drawing of "Quaint old Court Yard, Dorking, Surrey", was identified thanks to readers of the *Dorking Advertiser* as being off Farnborough Passage

between Numbers 66 and 70 High Street. It adjoined the lost Sainsbury's site and was part of an extraordinary localised concentration of basements, cellars below cellars, the caves of the former Rock brewery and beerhouse (later used for mushroom farming) and at least one further now lost tunnel.

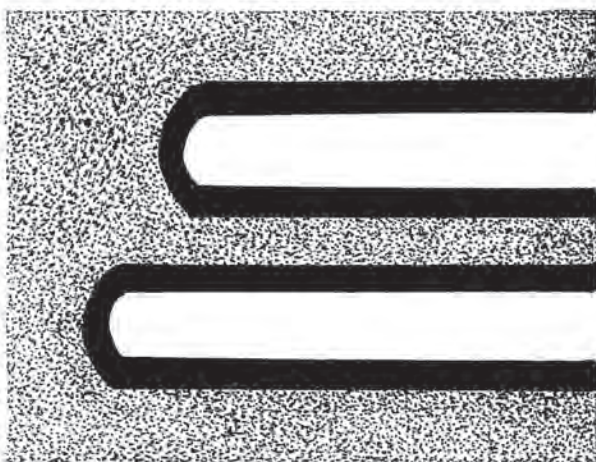
Created as storage space, it was also used as a Christmas grotto, but is now blocked by modern buildings. You have to dream of it being walled off and closed to the light still draped, tinselled and starred for a long-past Christmas. There are, however, two easily seen examples of similar short tunnels next to the rather lovely Castle Mill, plus several more known of behind the High Street frontage, often altered, shortened or destroyed during successive waves of sand extraction.



Storage tunnels by Castle Mill



Castle Mill



Scratching the Surface

Normally this would be a sad litany of loss, but the demolished sites are outnumbered by potentially still existing ones. Not to mention the likely hidden ones that have been wholly forgotten. All but two sites remain (though some have been firmly sealed) of the twelve visited by Chelsea Speleological Society during the 1970s. Wartime accounts point to others, including the

ARP's Dorking Report Centre in the basement of the then town hall, Pippbrook House, "with walls and ceilings strengthened to make them as bombproof as possible".

At the end of World War II it was revealed that every workshop and manufacturing concern in the town had been engaged in war work. They would have had to make provision for the safety of their staff. There would have been no better direction to turn for this than downwards. Records held by Dorking Museum document at least two other historically interesting caves, albeit possibly long since destroyed.

In Dorking, as in many towns, it is worth walking with your gaze high and directed across the road. Hand-carved beams frame doors and windows, green men gaze with malice from column tops, terracotta flowers bloom, a dragon flexes its wings, lions bare their teeth, a brick owl ponders the message "Let There Be Light", and behind Georgian and Victorian parapets earlier rooflines weave and sag.

But break the rule, tread the same streets and keep your head down, and something else is revealed. A wonderland of ways down, a montage of manholes, an invitation of entrances. Building after building, shop after shop, with a disused hatch, a leaf-choked grating, a never-lifted coalhole cover, or railed steps down to a long-locked door. Ventilators, manhole covers, filled and grilled cellar entrances. More places than you could ever get permission to prise open and visit.

There's a whole town down there.

Where to Visit

The following sites are open to the public:

South Street Caves: www.dorkingmuseum.org.uk/south-street-caves

Deepdene Trail: www.deepdenetrail.co.uk

Dorking Museum: www.dorkingmuseum.org.uk

The surface interiors at the Old King's Head Court and *White Horse Hotel* (addresses in article) can be viewed and both serve refreshments. Anyone shopping at the several retail establishments also mentioned here will similarly enjoy the goods on sale and the period details both inside and outside.

Betchworth Chalkpits: www.surreywildlifetrust.org/reserves/betchworth-quarry-lime-kilns

Brockham Limeworks: www.surreywildlifetrust.org/reserves/brockham-limeworks

The Castle Mill (RH4 1NN) caves can be seen from the adjoining public footpath, which runs down from the *Watermill Pub* car park.

Reigate Caves: www.reigatecaves.com

References:

Alexander, M. (1985). *Tales of Old Surrey*. Newbury: Countryside Books.

Alexander, M. (2004). *A Surrey Garland*. Newbury: Countryside Books.

Anon (believed to be Dennis, J.). (1855). *A Hand-Book of Dorking*. Dorking: J. Rowe Reprinted (1974). Dorking: Kohler and Coombes.

Bright, J. (1876). *Dorking, a History of the Town, with a Description of the Distinguished Residences, Remarkable Places, Walks and Drives, and Literary Associations*. Dorking: R.J. Clark.

Cook, A. (2008). *Cash for Honours*. Chalford: The History Press.

Emmerson, A. and Beard, T. (2004). *London's Secret Tubes*. Harrow: Capital Transport.

Harding, K. (1997). *Dorking Revisited*. Stroud: Sutton Publishing Ltd.

Henderson, J. and Hillman, B. and Pearman, H. (1968). *More Secret Tunnels in Surrey*. London: Chelsea Speleological Society.

Higgins, B. and Ettliger, V. (2001). *The Great House on Butter Hill in Dorking History 2001*. Dorking: Dorking Local History Group

Hughes, R. (2016). *Deepdene's Darkest Days: the Scandalous Story of the Deepdene Hotel*. Talk delivered to coincide with opening of the Deepdene Trail.

Jackson, A. (1989). *Around Dorking in Old Photographs*.

Gloucester: Alan Sutton Publishing.

Jackson, A. (editor). (1991). *Dorking: A Surrey Market Town through Twenty Centuries*. Dorking: Dorking Local History Group.

Knight, D. (1989). *Dorking in Wartime*. Dorking: David Knight.

L'Estrange, E. (1929). *Witch Hunting and Witch Trials. The Indictments for Witchcraft from the Records of 1373 Assizes Held for the Home Circuit, A.D. 1559– 1736*. New York: Routledge Library Press.

Mayhew, H. (1851). *London Labour and the London Poor*. London: George Woodfall and Son.

Pearman, H. (compiler). (1963). *Secret tunnels in Surrey*. Powys: Chelsea Speleological Society.

Pearman, H. (compiler). *Caves and Tunnels in South-East England*. London (1976): Chelsea Speleological Society.

Caves and Tunnels in South-East England: Part 2. London (1978): Chelsea Speleological Society.

Rose, C. (1878). *Recollections of Old Dorking*. Guildford: West Surrey Times. Reprinted in Kohler, M.K. (1977). *Memories of Old Dorking*. Dorking: Kohler and Coombes.

Timbs, J. (1822). *A Picturesque Promenade Round Dorking*. London: John Warren.

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Tunnels discovered at Esher, Surrey

A surprise discovery of tunnels dug in sand at a site for a new Post Office at Esher in 1955 was reported as follows ...

The discovery of some underground passages or caves in the centre of Esher has caused a flutter in antiquarian circles and a temporary hold-up in the work of excavating test holes to find out what the subsoils are like on the site of the new Post Office near 'The Windsor Arms' ... Last Friday one of the men, Mr. Jack Cape, was digging at a depth of about 14 feet, watched by his companion, Mr. G. Underdown, when suddenly he practically disappeared. White faced and shaking, he scrambled out of a hole into which he had fallen and then Mr. Underdown went down a ladder and started to explore.

He found that the test hole had been driven through the roof of an underground passage running approximately east and west.

The tunnel was subsequently examined by F.J. Tayler of the *Esher News* and T.E.C Walker of Cobham (a member of the Surrey Archaeological Society). A 5 feet long chamber with a gothic arch ceiling profile was reported running in the direction of the Esher schools. On the end wall was an incised depiction of a face within a circle.

In the opposite direction, towards the old church, there was a collapse, barring further progress. A small hole at floor level, however, gave access to a further walking-height tunnel in which was noted a further total collapse. SOURCE: ANON 1955, Underground caves discovered: strange find on new Post Office site. *Esher News & Advertiser*, 9 September 1955.



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The discount code can be used in any of their 58 stores (there is a barcode on the letter), and for telephone and online orders.

**** Please do not share or abuse the code as this may lead Cotswold to withdraw it which would be a great shame and spoil things for the rest of our members. ****

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